

User 's Guide



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RD260A RECORDER **Instr uction Manual**



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It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct, but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, patient-connected applications.

INTRODUCTION

Thank you for purchasing the OMEGA industrial strip-chart recorder.
The RD260A recorder conforms to the EMC standard as follows.
EM1 EN55011: class A
EMS EN50082-2

To take full advantage of numerous capabilities and to operate this instrument correctly and efficiently, please read this Instruction Manual before use.
This manual describes both Pen and Dot-printing models of the SR1000 recorder.

NOTE

- The contents of this manual is the subject to change without notice.
- All reasonable effort has been made to ensure the accuracy of the contents of this manual. However, if you find any ambiguous descriptions, please inform OMEGA.
- All rights reserved. No part of this manual may be reproduced or transmitted in any form.

SAFETY PRECAUTIONS

This recorder is developed to satisfy and to be used under the following conditions:

- The recorder is a component type instrument to be installed on an instrumentation panel or rack.
- The recorder complies with EN61010-1.
- The recorder conforms to EN55011 (EMI) Group 1, Class A (for commercial and industrial use).
- This instrument complies with Installation (over-voltage) Category II.

The following safety precautions must be observed during all phases of operation, maintenance, and repair of the recorder. If this instrument is used in a manner not specified in this manual, the protection provided by this instrument may be impaired. Also OMEGA assumes no liability for the customer's failure to comply with these requirements.

General definitions of safety symbols used on the recorder and in this manual.



Monitory symbol; the elements marked with this symbol alert the user to refer to the instruction manual to avoid personal injury or recorder damage.



Protective grounding terminal; this terminal must be connected to the ground before turning the power switch on.



High temperature; to avoid injury caused by hot surface, don't touch the heats in.



Alternative current;

This manual uses the following signs for safety precautions:

WARNING

A **WARNING** sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in personal injury or death of personnel.

CAUTION

A **CAUTION** sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the recorder.

Power Supply

Ensure the source voltage matches the specified power supply voltage before turning on the power.

WARNING

Protective Grounding

Make sure to connect the protective grounding to prevent an electric shock before turning on the power.

Necessity of Protective Grounding

Never cut off the internal or external protective grounding wire or disconnect the wiring of protective grounding terminal. Doing so poses a potential shock.

Defects of Protective Grounding and Fuse

Do not operate the recorder when protective grounding or fuse might be defective.

Fuse

To prevent a fire, use the fuse with specified ratings. Before replacing the fuse, turn off the power and disconnect the power source. Do not use an off-specification fuse or short circuit the fuseholder.

Do not Operate in an Explosive Atmosphere

Do not operate the recorder in the presence of flammable liquids or vapors. Operation of any electrical instrument in such an environment constitutes a safety hazard.

Keep Away from Live Circuits

Inside this recorder there are areas of high voltage; therefore, never touch the interior when the power supply is connected. The recorder has replaceable parts and subassemblies; however, the replacement must be carried out only by OMEGA service personnel or properly trained personnel only.

External Connection

Before connecting to measurement and control unit, connect the protective grounding wire.

HOW TO USE THIS MANUAL

Relationship between chapters and their purposes or timing to read is broken down in the table below:

●: Necessary to read

○: Optional to read

Chapters	Purchase & Installation	Daily Operation/ Maintenance	Setting Renewing	Trouble-shooting
Safety Precautions	●	●	●	●
1 Before Installation	●			
2 Installation	●			
3 Component Names & Functions		●	○	
4 Daily Operation		●		○
5 Data Setting Guides			●	
6 SET Mode			●	
7 SETUP Mode			●	
8 Troubleshooting				●

For the specifications of this recorder, refer to the General Specification Sheet

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Chapter 1 **BEFORE INSTALLATION**

This chapter describes the necessary preparations before handling the recorder; read them for safe handling.

1.1 Handling Precautions

The recorder contains many plastic parts. To clean, use a soft, dry cloth. Do not use chemicals such as benzene or thinner, since these may cause discoloration or damage.

Do not bring any objects charged with static electricity near the signal terminals. This might cause malfunction.

Do not allow any volatile substances to the front glass or key panel. Do not allow rubber or vinyl to remain in contact with the recorder for long periods.

Whenever the recorder is not used, turn the power switch off.

Turn the recorder power switch off as soon as any symptoms of malfunction such as unusual sound, smell, or smoke yield from the recorder. Also turn the main power switch off.

If a malfunction occurs, contact your sales representative or nearest service center.

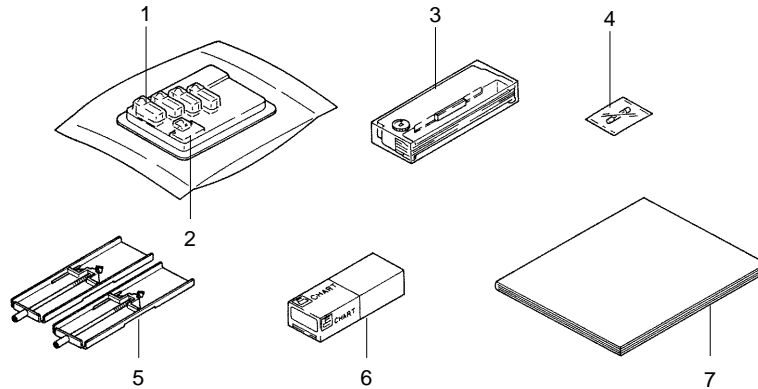
1.2 Checking and Unpacking

This recorder has been thoroughly inspected before shipment; however, when you receive the recorder, check that all accessories are present and in the correct quantities. Also check the external appearance of the recorder to ascertain that no damage has occurred.

1.2.1 Checking Accessories and Appearance

The recorder should be accompanied by the accessories indicated in the following. Check that all are present in the correct quantities. Also check the external appearance of the recorder to ascertain that no damage has occurred.

Accessories



No.	Name	Qty	Remarks
1.	Disposable felt pen		
	1-pen mode	1	Red
	2-pen model	2	Red, green
	3-pen model	3	Red, green, blue
			} Only for pen model
2.	Plotter pen	1	
3.	Ribbon cassette	1	Only for dot-printing model
4.	Fuse	1	250V, 500mA, time-lag type
		1	Recorders with a gray power switch
		1	250V, 800mA, time-lag type
			Recorders with a white power switch
5.	Mounting brackets	2	
6.	Z-fold chart paper	1	Approx. 16 m
7.	Instruction manual	1	

Spare Parts

Name	Part No.	Qty	Remarks
Disposable felt pen (red)	RD260-01	3	} Only for pen model
Disposable felt pen (green)	RD260-02	3	
Disposable felt pen (blue)	RD260-03	3	
Plotter pen	RD260-PP	3	
Ribbon cassette	RD260-RC	1	Only for dot-printing model
Fuse	A1360EF	4	250V, 500mA, time-lag type
			Recorders with a gray power switch
	A1512EF	4	250V, 800mA, time-lag type
			Recorders with a white power switch
Mounting brackets	B9900CW	2	
Z-fold chart paper	RD260-ZFP	6	Approx. 16 m
	B9901AZ	1	Only for dot-printing model

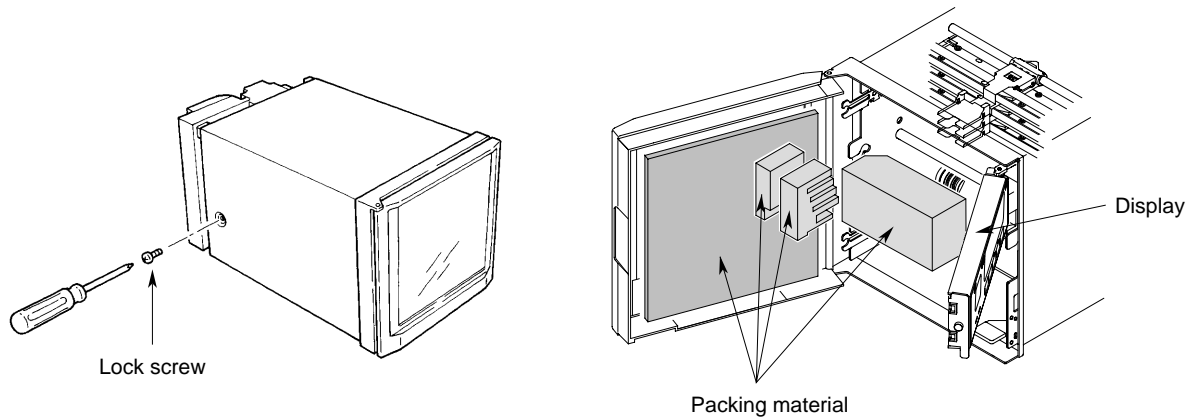
1.2.2 Removing Packings

The internal assembly is secured in position by packings to safeguard against damages during transit. When you unpack the recorder, remove the packings referring to the following.

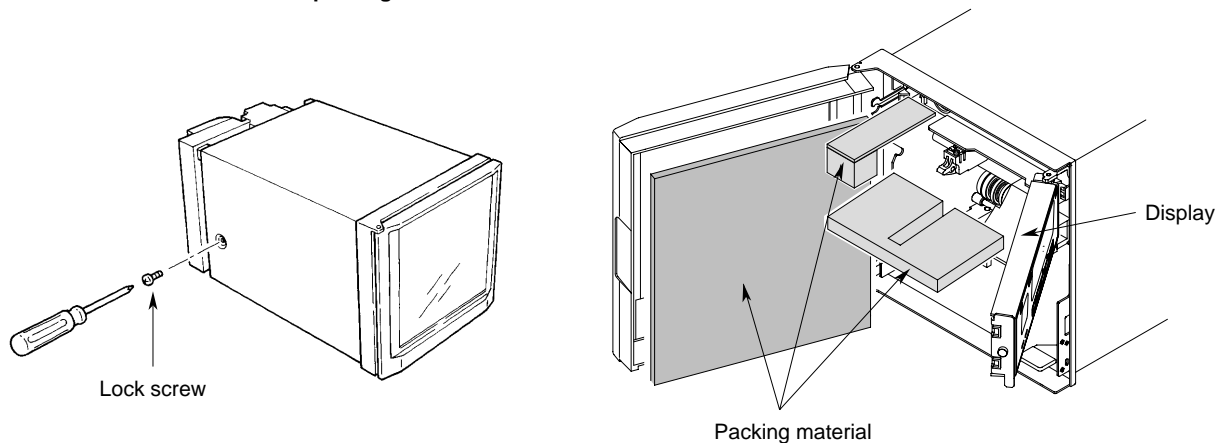
- (1) Remove the lock screw securing the interior of the recorder during transit.
- (2) Open the front door, and open the display by pulling its left end after removing the adhesive tape.
- (3) Remove all packings.

Removing Lock Screw and Packings for Transit

Pen model



Dot-printing model



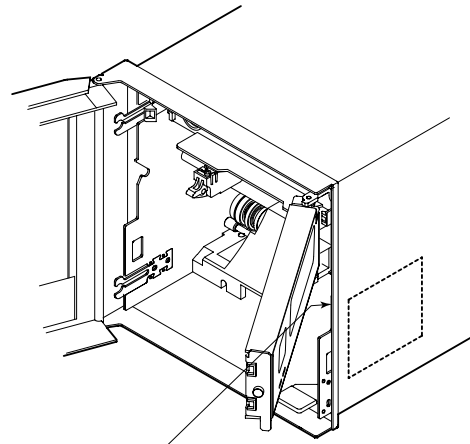
CAUTION

Please take care not to apply any undue pressure in an upward or downward direction to the display. This might cause a strain on the hinges.

1.2.3 *Checking Model Codes*

Check the model codes on the nameplate to make sure they are as specified by your order.

The nameplate is visible after you remove the chart cassette and is as shown in the figure below.



Nameplate

Checking Model Codes

Chapter 2 **INSTALLATION**

This chapter describes the installation method of the recorder: selecting the installation site, mounting and wiring methods. Read this chapter before installation.

2.1 Installation Site and Mounting Methods

2.1.1 Installation Site

The recorder should be installed according to the following conditions as close as possible.

To use this recorder within domestic establishments and within establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes may cause malfunction of other equipments. Please avoid using in domestic environment.

Panel and rack mounting

The recorder is designed to be installed on an instrumentation panel or rack.

Well ventilated location

Install the recorder in a well ventilated site to prevent from internal temperature rise.

Avoid mechanical vibration

To install the recorder in a location susceptible to mechanical vibration will adversely affect the mechanical parts and the quality of recording. Please choose an installation site characterized by minimal mechanical vibration.

Horizontal installation

This recorder must be installed horizontally (however, mounting may be inclined up to 30° backward from vertical).

Avoid direct sunshine or heater radiation

The recorder will be adversely affected if the unit is exposed to direct sunlight or installed near a heater. Choose a location near room temperature (23°C) with minimal temperature fluctuation.

Keep out of soot, steam, moisture, dust, corrosive gases

To expose the recorder to soot, steam, moisture, dust, corrosive gases, etc., will adversely affect it.

Keep away from electro-magnetic fields

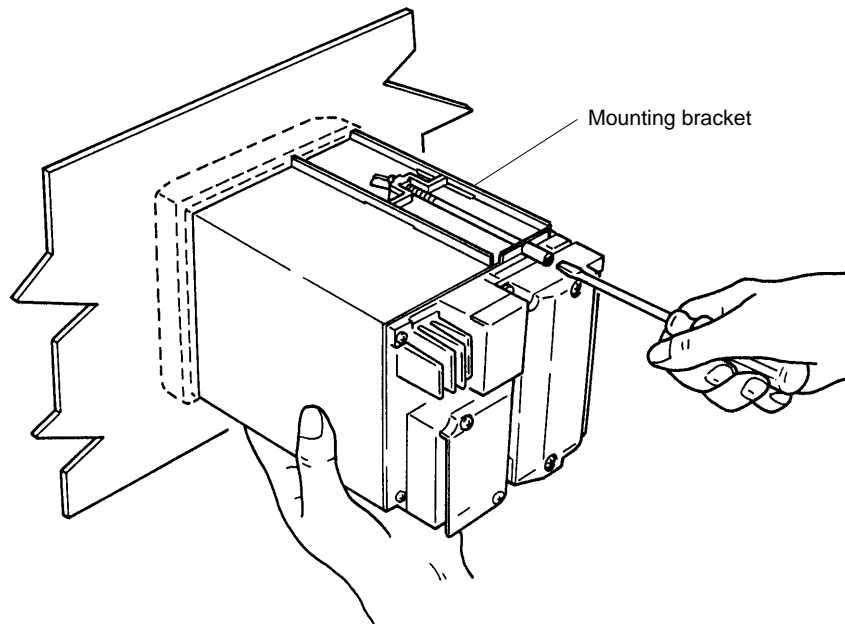
To use the recorder within strong electro-magnetic fields may cause malfunction. Please avoid installing near electro-magnetic objects.

2.1.2 Mounting Methods

- (1) Mount the recorder on a steel panel whose thickness is at least 2 mm (and up to 26 mm).
- (2) Insert the recorder into the panel-front face.
- (3) Fix the recorder to the panel using the mounting brackets as shown below. Adequate screw tightening torque is approximately 8 to 12 kg-cm. A pair of mounting brackets can be applied to the recorder's top and bottom, or to both side faces. Remove the seals covering the holes for the brackets before attaching them.

CAUTION

A tightening torque exceeding the above-mentioned adequate values may cause deformation of the recorder case or brackets.

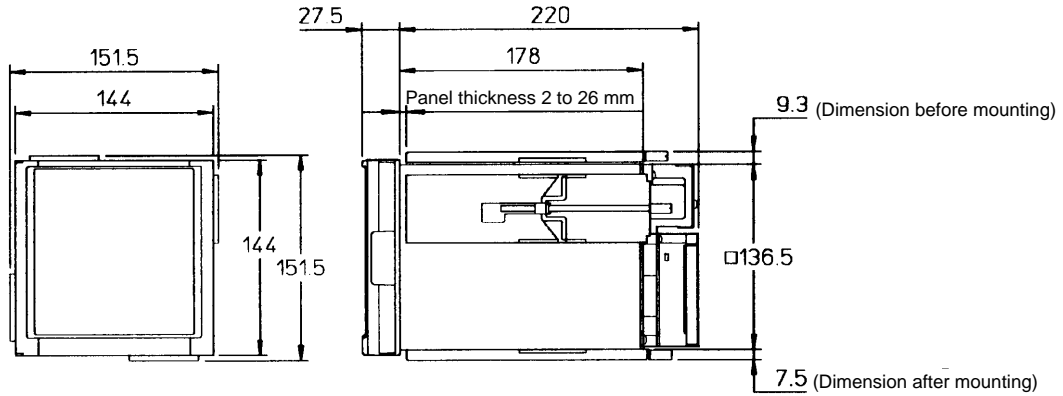


Mounting

2.1.3 External Dimensions

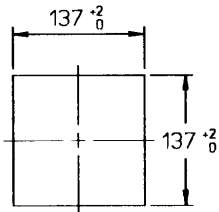
Unit: mm

Unless otherwise specified, dimensional tolerance is ±3%; however, for less than 10 mm, it is ±0.3 mm.

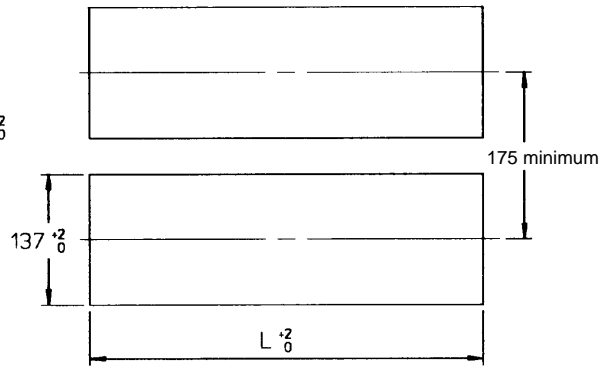


Panel cutout

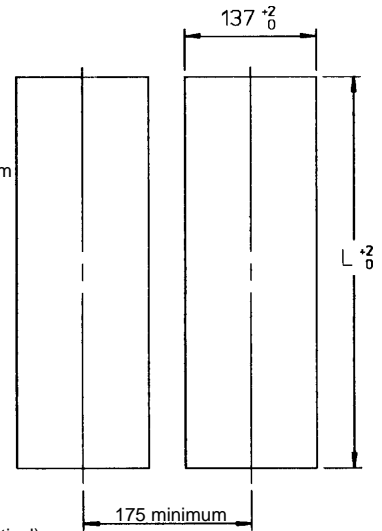
Panel cutout for single installation



Multi-mounting(horizontal)



Multi-mounting, maximum 3 units(vertical)



Number of unit	$L + \frac{2}{0}$ (mm)
2	282
3	426
4	570
5	714
6	858
7	1002
8	1146
9	1290
10	1434
n	$(144 \times n) - 6$

Multi-mounting(vertical)

Panel Cutout and External Dimensions (Including Mounting Brackets)

NOTE A pair of mounting brackets should be used on the top and bottom, or on both sides of the recorder.

2.2 Wiring

Wiring should be done only after you have read this section. The section consists of the following subsections:

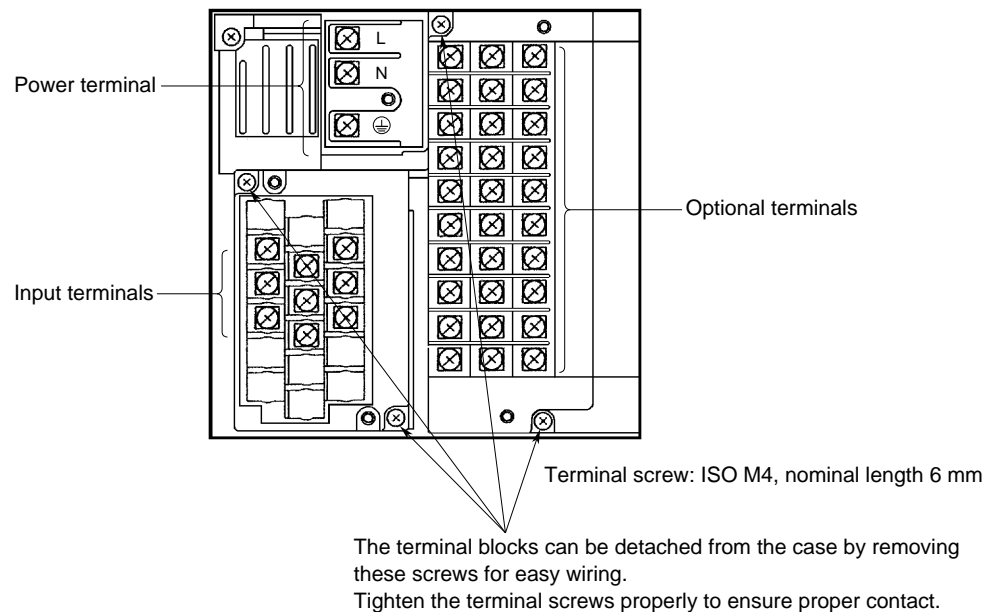
- 2.2.1 Rear Panel Terminal Arrangement
- 2.2.2 Power Supply Wiring
- 2.2.3 Input Signal Wiring
- 2.2.4 Alarm Output Wiring
- 2.2.5 Remote Control Wiring

WARNING

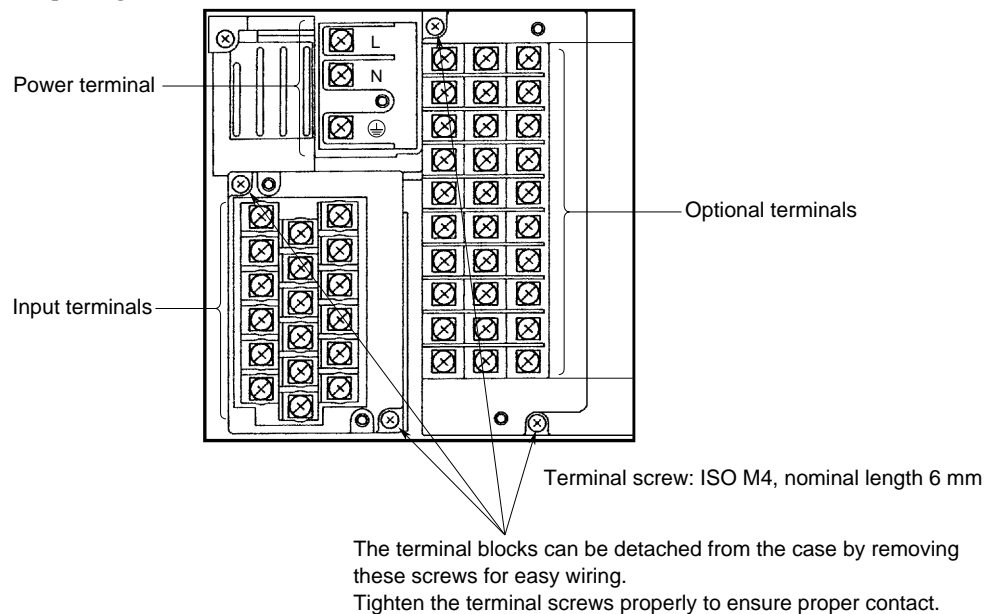
Make sure to fasten the wiring at the rear wall of the mounting panel and employ some kind of strain relief between the rear wall and the recorder.

2.2.1 Rear Panel Terminal Arrangement

Pen model

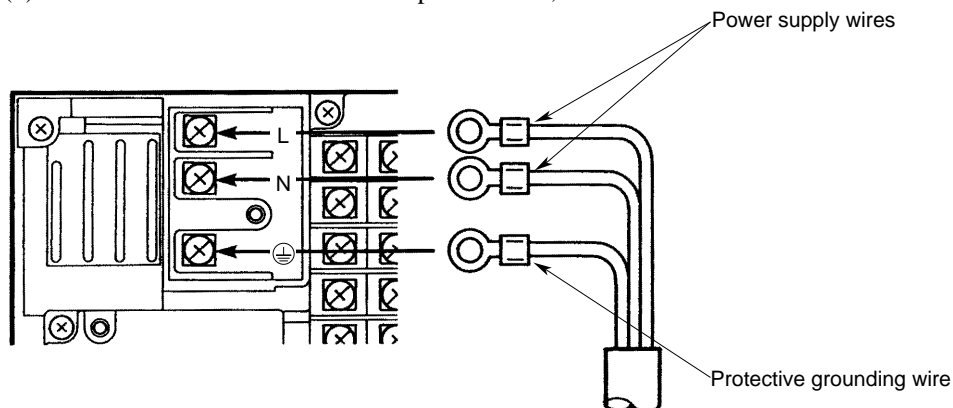


Dot-printing model



2.2.2 Power Supply Wiring

- (1) The rated power supply voltage for the recorder is follows.
 - 100 to 240 V AC
- (2) Turn the recorder's power switch off.
- (3) Open the transparent cover of the power terminal after releasing the cover screw.
- (4) Connect the power supply wires and the protective ground wire to the terminal.
- (5) Cover the terminals with the transparent cover, and secure the screw.



Power Supply Wiring

WARNING

- To prevent an electric shock, ensure the main power supply is turned off before wiring.
- To prevent fire, use 600 V PVC insulated wire (AWG18) for power and ground wiring (cross sectional area of 0.83 mm² or thicker, anti-galvanic corrosion finish, insulation thickness should be more than 0.8 mm, insulation resistance should be more than 50 M /Km at 20°C, approved EN60 320 (VDE0625)), or equivalent cables.
- Connect the protective grounding wire to the earth through grounding resistance less than 100 before turning on the power.
- Use crimp-on lugs (for 4 mm screws) with insulation sleeves.
- To prevent an electric shock, cover the power terminals certainly with the transparent cover.
- Make sure to apply a power switch near by with the following characteristic:
 - rated power current > 1A
 - rated rush current > 60A
 - fuse (s) of 2A to 15A is (are) necessary.

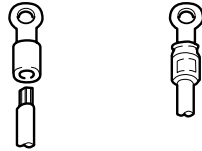
NOTE

- Do not apply a power supply in the range from 132 V to 180 V AC. Doing so might affect the measuring accuracy.
- To prevent an emission of electromagnetic disturbances, separate the power supply wires from the other wires at least 0.1 m. Over 0.5 m is recommended.

2.2.3 Input Signal Wiring

- (1) Turn off the recorder power switch.
- (2) Remove the transparent cover for the input signal terminals.
- (3) Connect the input signal wires to the terminals.
- (4) Attach the cover on the terminals, and secure the screws.

It is recommended to use the crimp-on lugs (for 4 mm screws) with insulation sleeves for lead wire ends, but they are not required for thermocouples (TC).



Crimp-On Lugs

Suggestions to minimize noise pickup:

- Separate the measuring-signal wires from power lines and grounding lines.
- It is desirable that the measuring object is not a noise source; if not, insulate it from the measuring-signal wires and ground the object.
- It is recommended to use shielded wires to minimize noise pickup from an electrostatic induction source. The shields are connected to the recorder's grounding terminal, if necessary. In that case, avoid two-point grounding.
- To minimize the noise from an electrostatic induction noise, twist the measuring wires (a pair of wires) in short and equal intervals.
- The grounding line must have low resistance.

In case of using a thermocouple (TC), the recorder is equipped with a reference junction compensator, so the ambient temperature around the recorder's terminal board should be kept as stable as possible.

- Cover the input terminals with the transparent cover.
- Do not use a large-diameter wire (cross sectional area of more than 0.5 mm²) because it has a large radiation rate.
- Keep the ambient temperature as stable as possible; start/stop of a nearby fan affects the temperature.

If input signal wires are connected to two or more receivers with parallel connection, measured values sometimes affect each other. The following notes should be observed for parallel connection:

- Ground each receiver at the same point.
- Do not turn on/off the power of a receiver while other receivers are in measuring operation.
- A resistance temperature detector (RTD) cannot be used essentially in parallel connection.

WARNING

To prevent an electric shock, ensure the main power switch is turned off when wiring.

CAUTION

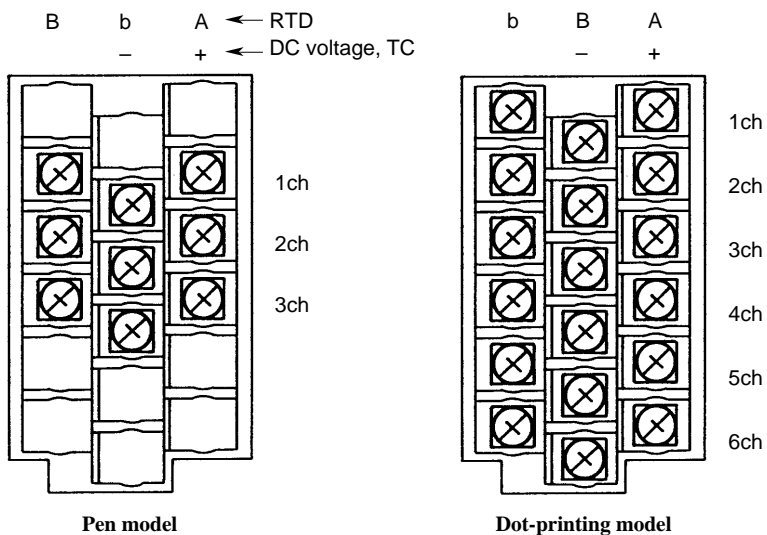
Do not apply inputs exceeding the rated range as follows to prevent the recorder from damage:

- Maximum input voltage
 - ±10 V DC for TC, and for the voltage range of 2 V DC or less
 - ±30 V DC for the voltage range of 6 to 20 V DC
- Maximum common mode voltage
 - 250 V AC rms (50/60 Hz)
- The installation of each input is Category II.

NOTE

- To prevent an emission of electromagnetic disturbances, separate the input wires from the other wires at least 0.1 m. Over 0.5 m is recommended.

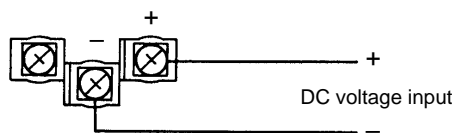
Terminal Board



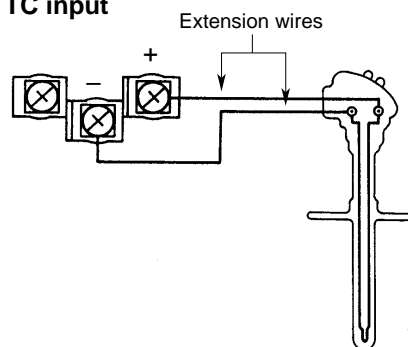
2. INSTALLATION

Wiring for Input Terminals

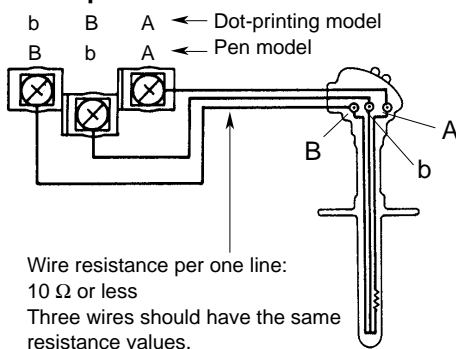
DC voltage inputs



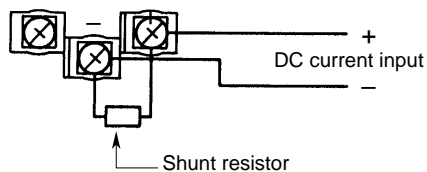
TC input



RTD input



DC current input



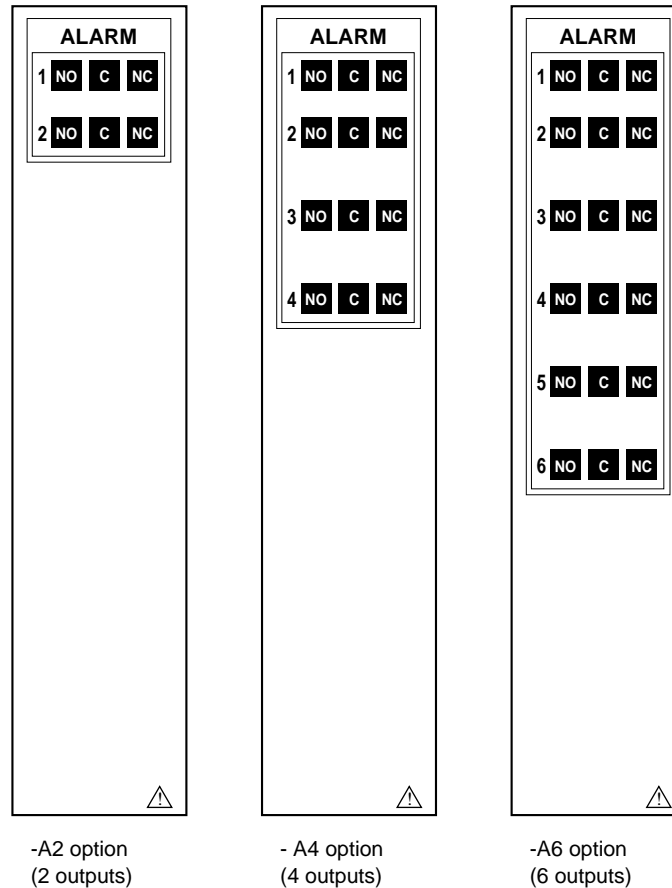
(Example) The shunt resistor rating is 250 Ω ±0.1% for the current input of 4 to 20 mA.

2.2.4 Alarm Output Wiring (option)

NOTE The following settings are available only for the model with relay options (-A2, -A4, -A6).

- (1) Turn the power switch off.
- (2) Remove the transparent cover of the optional terminals.
- (3) Connect the alarm output wires to the optional terminals.
- (4) Cover the terminals with the transparent cover and secure the screws.

Depending on the type (the number of outputs) of alarm relay options, the terminal arrangement changes as shown in the following:



Alarm Output Terminal Arrangements

Contact characteristics:

Output type : Relay transfer contacts
Output capacity : 250 V AC (50/60 Hz), 3 A
250 V DC, 0.1 A (resistive load)

Dielectric strength : 1500 V AC (50/60 Hz) for one minute between output terminals and grounding terminals

WARNING

To prevent an electric shock, ensure the main power switch is turned off before wiring.

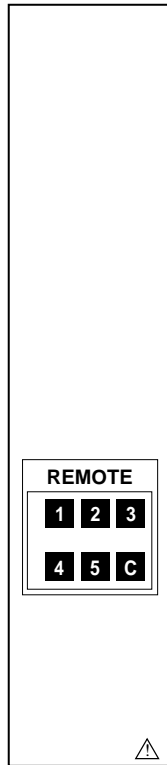
NOTE To prevent an emission of electromagnetic disturbances, separate the alarm output wires from the power supply and input wires at least 0.1 m. Over 0.5 m is recommended.

2.2.5 Remote Control Wiring (option)

NOTE The following settings are available only for the model with remote options (R1).

- (1) Turn the power switch off.
- (2) Remove the transparent cover of the optional terminals.
- (3) Connect the wires for remote control to the optional terminals. The “C” is the terminal common to other 1 to 5.
- (4) Cover the terminals with the transparent cover and secure the screws.

Remote control terminals are arranged as follows:



Remote Control Terminal Arrangements

Input characteristics:

Input signal : Dry contact, open-collector (TTL or transistor) signal

Control functions and signal types:

- Recording start/stop level
- Chart speed change level
- Printout messages trigger more than 250 msec

Signal characteristics : ON voltage 0.5 V or less (30 mA DC)
Leakage current in OFF state 0.25 mA or less
Signal duration 250 msec or more

Input types : Photocoupler isolation (one line common)
Internal isolated power source (5 V \pm 5%)

Dielectric strength : 500 V DC for one minute between input terminals and grounding terminal.

WARNING

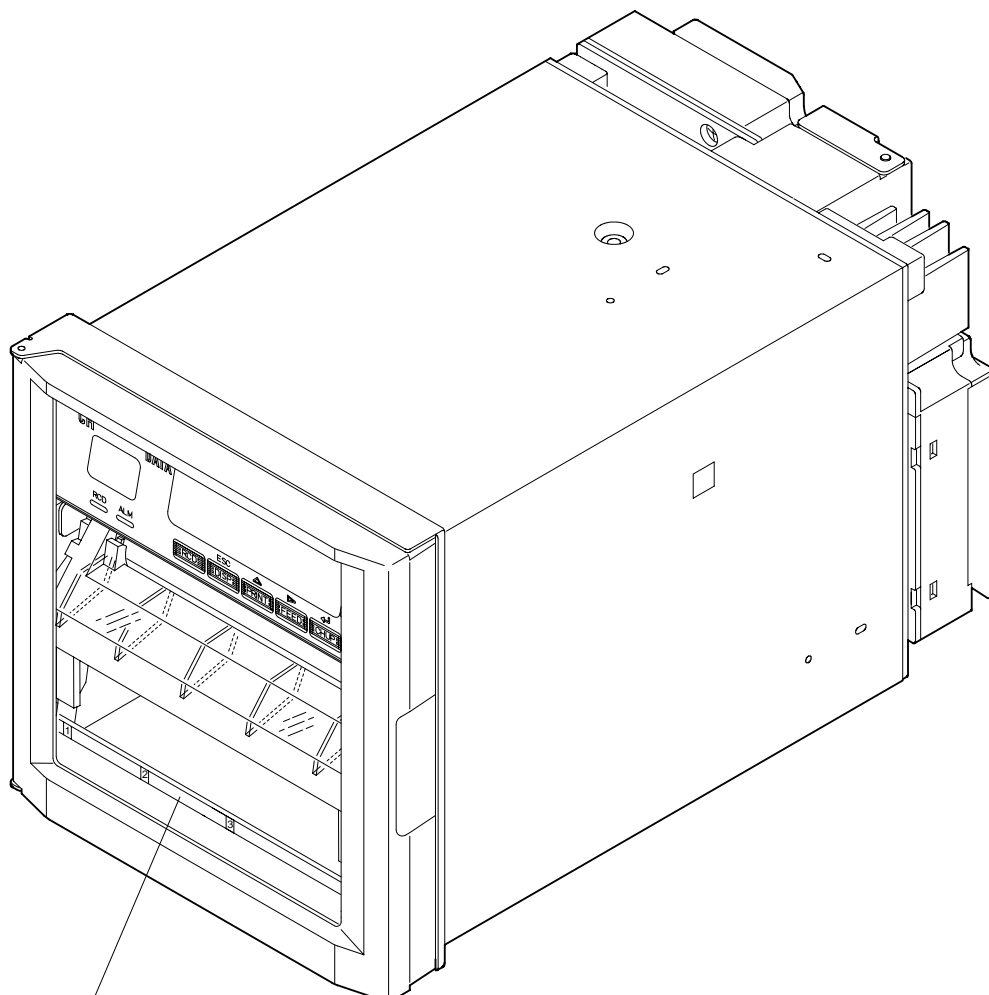
To prevent an electric shock, ensure the main power switch is turned off before wiring.

NOTE

- Use shielded cables for remote control signals to prevent noise pickup. The shield should be grounded at the recorder's terminal.
- To prevent an emission of electromagnetic disturbances, separate the remote control wires from the power supply and input wires at least 0.1 m. Over 0.5 m is recommended.

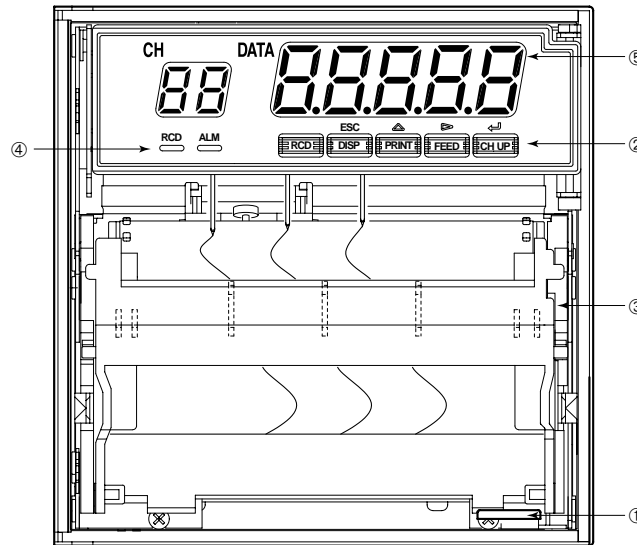
Chapter 3 COMPONENT NAMES AND FUNCTIONS

This chapter describes the names of components, and outlines their functions.



Tag plates
Use the recorder with units corresponding to each channel directly written on these plates respectively.

3.1 Front Panel



1. Power switch (push-button type)

Pressing the switch turns the power ON and OFF.

2. Key panel (push-key type)

The panel contains five keys.



[RCD] key

Pressing the key starts or stops the recording.



[DISP] key, **[ESC]** key

(DISP function)

Cycles through the modes of display in the order of AUTO, MANUAL, DATE, TIME and OFF. Also selects between the OPERATION and SET modes pressing for three seconds.

(ESC function)

Exits from the menu in the middle of setting or selecting procedures.



[PRINT] key, **[△]** key

(PRINT function)

Conducts the list printout (see subsection 4.6.1) and the SET UP list printout (see subsection 4.6.2).

(△ function)

Selects setting parameters (numerics or command codes). Selecting step is upward circulation.



[FEED] key, **[▷]** key

(FEED function)

The chart is fed as long as this key is being pressed (see subsection 4.5.2.)

(▷ function)

Changes the number of digits for setting numeric values. The digit moves from high to low.



[CH UP] key, **[ENT]** key

(CH UP function)

Selects a channel for which the display shows the screen in the MANUAL display mode.

(← function)

Makes a parameter entry or executes a function after selecting parameters (numerals or command codes). Pressing the key executes the settings.

3. Chart cassette

Contains a Z-fold chart (width: 100 mm, length: 16 m).

4. Status Display

RCD indicator : illuminated when recording of measurement values is in progress.

ALM indicator : will illuminate when an alarm occurs.

5. Data Display

This display shows the measurement values digitally. During entering settings, the display will show these settings.

3.2 Characters on the Display

The display consists of seven segments, and therefore characters exist which are difficult to display.

Characters are presented on the display as shown in the following table.

Display	A	b	c	d	E	F	G	H	h	I	J	K	L	l
Alphabet	A	B	C	D	E	F	G	H	h	I	J	K	L	l
Display	m	n	o	P	q	r	S	t	U	v	W	X	Y	Z
Alphabet	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

Chapter 4 DAILY OPERATION/ MAINTENANCE

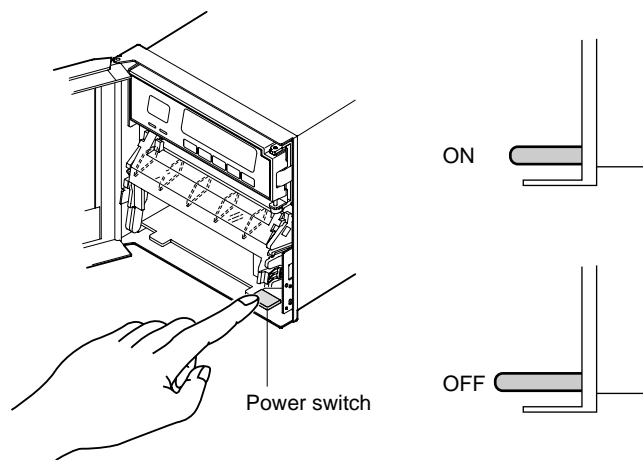
This chapter describes the daily operation and maintenance of this recorder. Read this chapter before operation.

4.1 Switching Power On/Off

The power switch is located at the lower right-hand corner of the front face behind the door.

The switch is a push-button type. Press the switch to turn 'ON' the recorder and press again to turn 'OFF'.

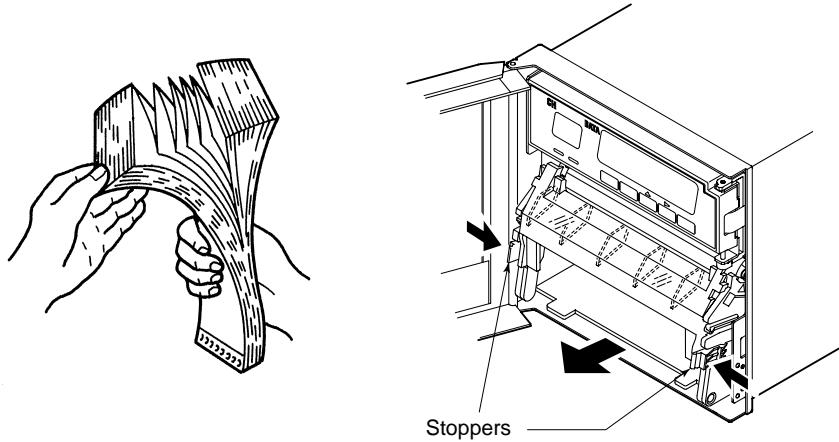
After the power turns on, the recorder executes a self-diagnostic check for several seconds before starting measurement and recording.



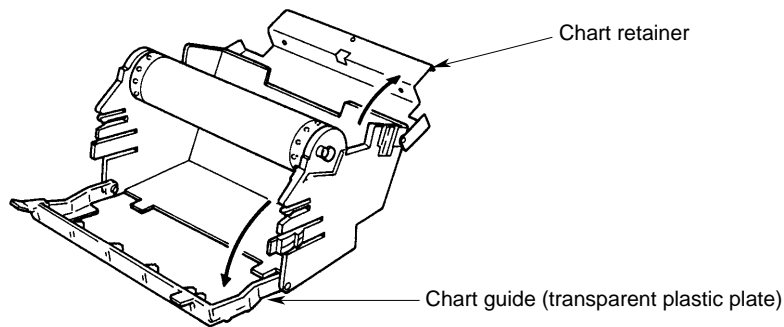
- NOTE**
- The warm-up time is approximately 30 minutes; however, after the initial start-up, the recorder might need more time.
 - If the input wiring is connected parallel with other equipment, do not turn the power switch on/off to prevent fluctuations in measuring values.

4.2 Installing (or Replacing) Chart Paper

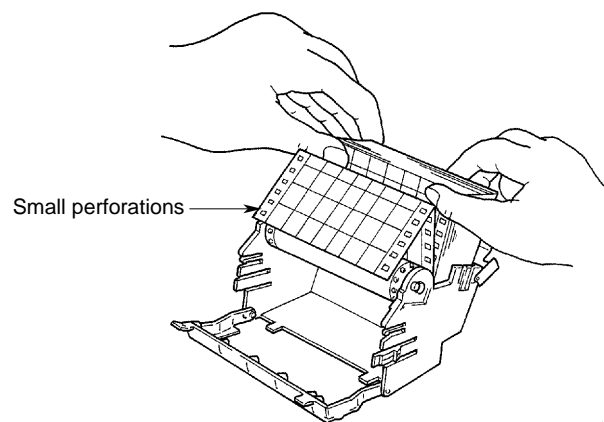
- (1) Open the front door of the recorder.
- (2) Check the recorder is not in recording state; but the power **ON** is allowed.
- (3) Riffle the chart thoroughly before loading.
- (4) While gently pressing the chart-cassette stoppers, located at both front ends of the cassette, lift and draw the cassette out of the recorder case.



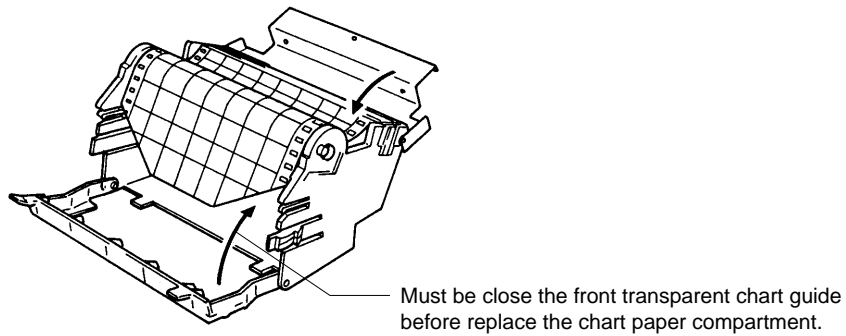
- (5) Open the chart retainer backward on the cassette.
- (6) Pull and open the front transparent chart guide.



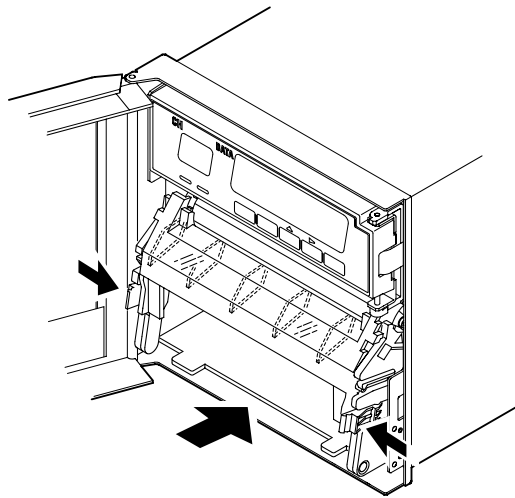
- (7) Load the chart paper into the chart compartment; the small perforations should be at the left-hand. Make sure that the sprocket teeth of the chart drives are properly engaged in the chart paper perforations. Take care not to load the chart paper backwards.



- (8) Close the chart retainer.
- (9) Close the chart guide (transparent plastic plate).



- (10) Replace the chart cassette back into the recorder case; hang the knurls of the cassette to the grooves of the case, and move the cassette to trap the stopper.



- (11) Press the **[FEED]** key on the key panel to assure that the chart moves two or more folds smoothly into the chart receiver. If it moves unsteadily, do the installing procedure again from step (4).

NOTE A red band with a 'RENEW CHART' notice appears when the chart nears to its end (length of remaining chart is approximately 40 cm) to suggest you to prepare a new chart.

CAUTION

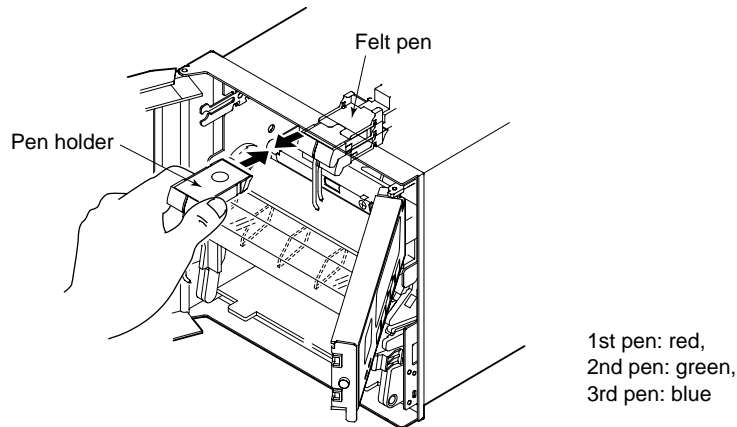
If you replace the chart paper compartment back into the unit without closing the front transparent chart guide, the lock tabs might be damaged.

4.3 Installing (or Replacing) Pens (Pen model)

Felt-tip pen

Simple replacement

- (1) Open the front door, and check to see that the recording is OFF, but the power **ON** is allowed.
- (2) Pull and open the display around the hinge.
- (3) Pull out the pen-cartridge by pulling the protruding part of the cartridge from the pen holder.



- (4) Remove the cap from a new felt-tip pen, and insert the pen firmly to the pen holder.
- (5) Press the **[RCD]** key to restart the recording.

CAUTION

- Do not press or pinch the felt tip to prevent deformation. Do not move the pen holder up- or down-scale to protect the driving mechanism.
- Always make sure to remove the pen cap before installation.

Replacement under pen-replacement mode

When a pen is located at a place where its replacement is difficult to do, relocate the pen by the following procedures:

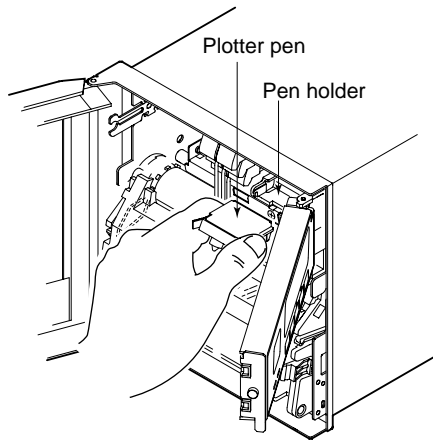
- (1) Check to see that the recording is OFF, but the power **ON** is necessary.
- (2) Press the **[PRINT]** key, then press the **[△]** key to display [**┌ _ P E n**], and press the **[ENT]** key.
- (3) Press the **[△]** key to display [**└ E S**], and press the **[ENT]** key. The pens will move near to the center of the scale where the pens can be easily replaced.

NOTE When the pens move, a line is drawn on the chart.

- (4) Replace the pen according to the 'Simple replacement', (2), (3), and (4) described above.
- (5) After pen replacement the indicator shows [**E n d**], then press the **[ENT]** key.
- (6) To restart recording, press the **[RCD]** key.

Plotter pen

- (1) Open the front door, and check to see that the recording is OFF, but the power **ON** is allowed.
- (2) Pull and open the display around the hinge.
- (3) Pull out the pen-cartridge by pulling the protruding part of the cartridge from the pen holder.



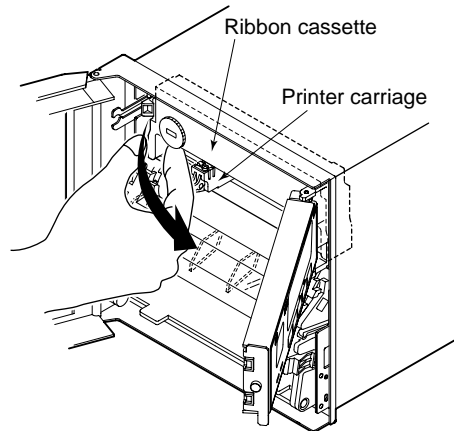
- (4) Remove the cap from a new pen, and insert the pen firmly to the pen holder.

CAUTION

Always make sure to remove the pen cap before installation.

4.4 Installing (or Replacing) Ribbon Cassette (Dot-printing model)

- (1) Open the front door, and check that the power is switched **OFF**.
- (2) Open the display by pulling its left end.
- (3) Hold the printer carriage, and move it to the right.
- (4) Hold the left-hand part of the ribbon cassette, and pull it out from the recorder case.



- (5) Insert a new ribbon cassette into the cassette holder; first, insert the right-hand part, next the left-hand part. Check that the cassette is properly engaged with the cassette holder snap.
If the cassette is not engaged with the holder properly, turn the ribbon feeding knob in the direction of the arrow to fit the peg to the driving hole of the holder.
- (6) To check that the cassette is properly inserted, turn the left-hand knob in the direction of the arrow a half or more turning.
- (7) If the ribbon loosens, turn the knob in the direction of the arrow to tighten it.
- (8) Turn the display back to the normal position.

CAUTION

- Improper insertion of the cassette may cause illegal-print color or damage to the cassette.

4.5 Getting the Recording

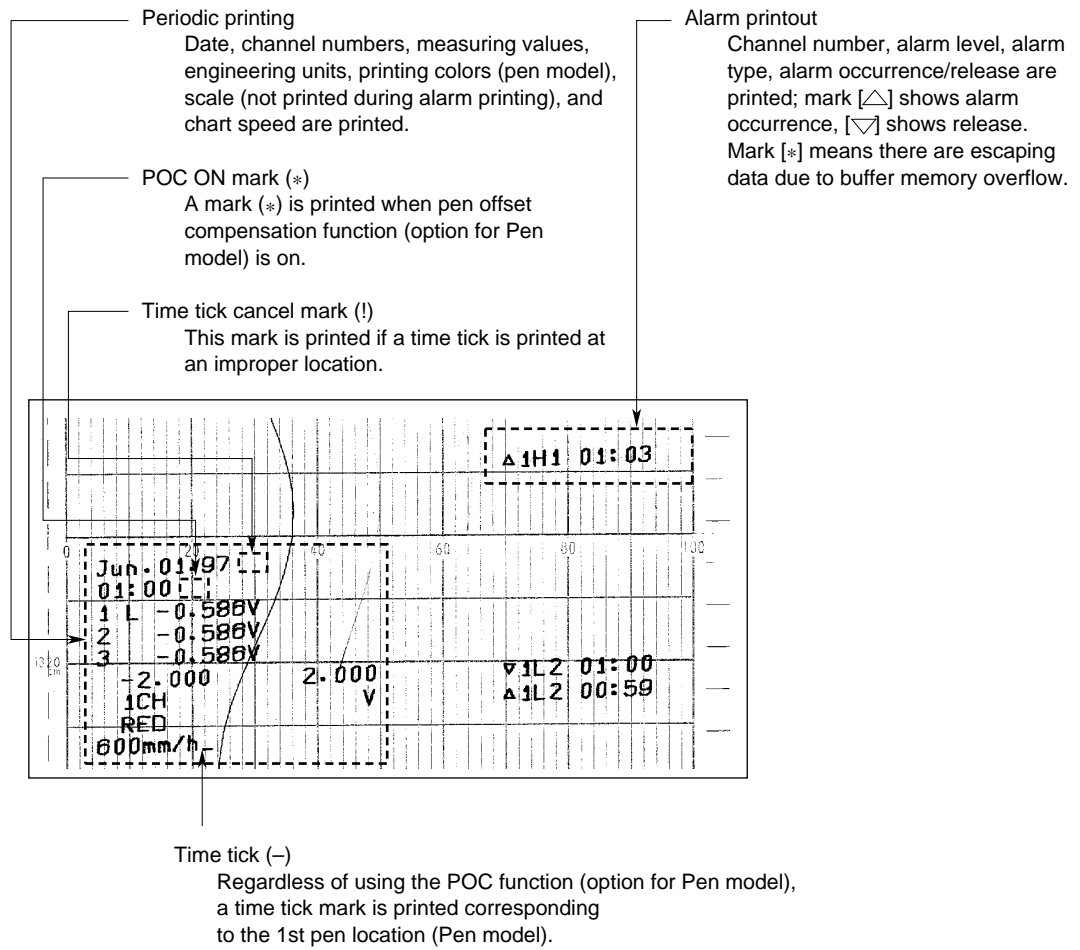
4.5.1 Starting/Stopping the Recording

Press the [RCD] key to start or stop the recording.

4.5.2 Feeding the Chart

The chart paper is fed by pressing the [FEED] key as long as the key is pressed.

4.5.3 Printing Samples



4. DAILY OPERATION/MAINTENANCE

4.6 Getting a Digital Printout

A digital printout can be any one of the following:

- List printout
- SET UP list printout

4.6.1 Getting a List Printout

A list printout includes the following setting values:

- Date/time/chart speed/2nd-chart speed/trend record interval (Dot-printing model)
- Channel number/range/span/scaling value/engineering unit
- Tag/offset value (if setting is on)
- Types of set alarms (if set)
- Message setting (if set up to 16 characters)

List printing is executed by the following procedure:

- (1) Press the [PRINT] key.
- (2) Press the [△] (PRINT) key to call up the [L ! S E] display, then press the [ENT] key.
- (3) Press the [△] key to select [S E R E], press the [ENT] key, and list printing will start.

When list printing starts, the display automatically returns to the screen that was on display before the printing began.

- NOTE**
- While list printing is executed, analog recording is interrupted; however, measuring and alarm detecting activities continue.
 - If an alarm occurs during list printout, the alarm printout starts just after the analog recording restarts.

If you want to interrupt a list printing, proceed as follows:

- (1) Press the [PRINT] key.
- (2) Press the [△] (PRINT) key to call up the [L ! S E] display, then press the [ENT] key.
- (3) Press the [△] key to select [S E O P], and press the [ENT] key. The list printing will stop and the recorder will return to the state before starting the list printing.

Nov. 01. 97 10: 00			
CHART SPEED 60mm/h		(2) 120mm/h	
CH	RANGE	SCALE LEFT	TAG No.
	LEFT END	SCALE LEFT	OFFSET
	RIGHT END	SCALE RIGHT	
1	6V		TEMP-01
	1.000V		0.000
	5.000		
2	Type T		TP002
	-50.0°C		0.2
	200.0		
3	6V(SCALE)	0.00kg/cm ²	DT02-03
	1.000V		-0.05
	5.000	20.00	
CH	ALARM1	RLY	ALARM2
	ALARM3	RLY	ALARM4
			RLY UNIT
2	H	150.0	01
		L	-20.0 02 °C
MESSAGE	1 = SR1000 PEN MODEL		
	2 =		
	3 =		
	4 =		
	5 =		

When the OFFSET or TAG setting is on in SET UP mode, this is printed.

Pen model Printing Sample

4.6.2 Getting a SET UP List Printout

A SET UP list printout includes the setting values of the following printing functions:

- Digital printing
- Alarm setting
- Burnout function and others

SET UP list printing is executed by the following procedure:

- (1) Press the [PRINT] key.
- (2) Press the [△] key to call [5 L 5 L] on the indicator, and press the [ENT] key.
- (3) Indicate [5 L 7 L] using the [△] key, press the [ENT] key, and the SET UP list printing will start.

When the SET UP list printing starts, the display automatically returns to the state before starting the list printing procedure.

- NOTE**
- While SET UP list printing is executed, analog recording is interrupted; however, measuring and alarm detecting activities continue.
 - If an alarm occurs during SET UP list printing, the alarm printout starts just after the analog recording restarts.

If you require to interrupt a SET UP list printing, execute the following procedure:

- (1) Press the [P R I N T] key.
- (2) Press the [△] key to call up the [5 L 5 L] display, and press the [ENT] key.
- (3) Press the [△] key to select [5 L 0 P], and press the [ENT] key. The SET UP list printing will stop and the recorder will return to the state before starting the list printing.

SET UP LIST			
PRINT			
ALM_PR	DIGI_PR	SPD_PR	CH_PR
ON1	ON1	OFF	ON
ALARM			
RELAY	ALM_HYS		
EMERG	ON		
CH	B.OUT	N_AVE	COLOR
1	OFF	OFF	PRP
2	OFF	OFF	RED
3	OFF	OFF	GRN
4	OFF	OFF	BLU
5	OFF	OFF	BRN
6	OFF	OFF	BLK
B.OUT	LOCK	TEMP	TAG
UP	NO	OFF	OFF
REM			
1:RECORD		2:CHART_SPD	
3:MESSAGE1		4:MESSAGE2	
5:MESSAGE3			

If the recorder fitted with the /D2 option, this is printed.

Dot-printing model Printing Sample

4.7 Selecting the Display

Five different displays can be selected. These are:

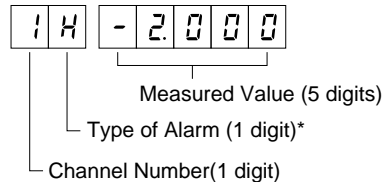
DISPLAY AUTO

Channel number and measured values will appear on the display.

When an alarm occurs, type of alarm will appear.

Every channel will be shown for approximately 2 sec. If the input is greater than the upper limit of the recording span, ---- will appear.

If the input is less than the lower limit of the recording span, ----- will appear.



*Type of alarm

H : high limit

L : low limit

h : high difference limit

l : low difference limit

DISPLAY MAN (except for the 1-pen model)

Channel number, measured values and type of alarm when it occurs will appear on the display for a specific channel only. This display looks the same as the AUTO display.

The display is updated every two seconds for Pen models and at every measurement period for Dot-printing model. Using the [CH UP] key, the displayed channel number will go up.

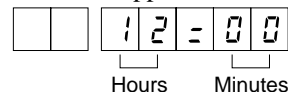
DISPLAY DATE

Date, including the year will appear on the display. Leap years are provided.



DISPLAY TIME

Time will appear on the display.



DISPLAY OFF

Displays other than status displays will be turned off.

Selecting a screen

Pressing the [DISP] key cycles through the screens in the following order:

AUTO: automatic-mode screen

MAN: manual-mode screen

DATE: date-mode screen

TIME: time-mode screen

OFF: off-mode screen

4.8 Maintenance

The activities necessary to maintain the recorder in good operating condition are shown below:

- Periodic maintenance (see subsection 4.8.1)
- Battery replacement (see subsection 4.8.2)
- Fuse replacement (see subsection 4.8.3)
- Cleaning plotter carriage shaft (see subsection 4.8.4)
- Calibration (see subsection 4.8.5)
- Pen adjustment (see subsection 4.8.6)
- Printer carriage adjustment (see subsection 4.8.7)
- Parts replacement (see subsection 4.8.8)

4.8.1 Periodic Maintenance

Check the following items periodically, and replace consumable parts, if necessary:

Are indication and recording normal?

If not, see chapter 8, "Troubleshooting".

Are recorded lines or printed characters clear, not blurred?

To replace a felt-tip pen or a plotter pen of Pen model, see section 4.3 "Installing (or Replacing) Pens"; also, see section 4.4 "Installing (or Replacing) Ribbon Cassette" to replace the ribbon cassette of Dot-printing model.

Is chart-paper feeding smooth, not jammed?

If not, see chapter 8, "Troubleshooting".

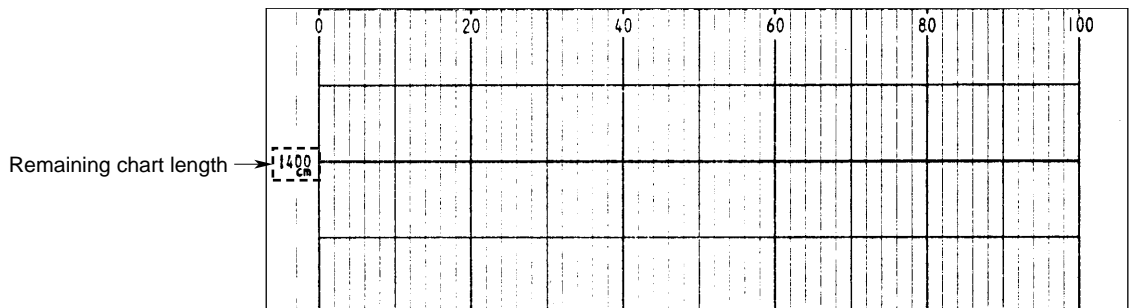
Is there enough chart paper left in the chart compartment?

Remaining chart length (cm) is printed on the left margin of the chart at intervals of 20 cm.

See section 4.2 "Installing (or Replacing) Chart Paper".

Is [- b A t -] illuminated?

If it is, see subsection 4.8.2, "Battery Replacement" as the lithium battery for memory backup needs to be replaced.



Indication of Remaining Chart Length

4.8.2 Battery Replacement

The [- 6 A 6 -] illumination indication shows lithium battery deterioration, which is used for memory backup. The battery has a lifetime of approximately 10 years under normal operation.

When [- 6 A 6 -] is illuminated, contact Omega Engineering.

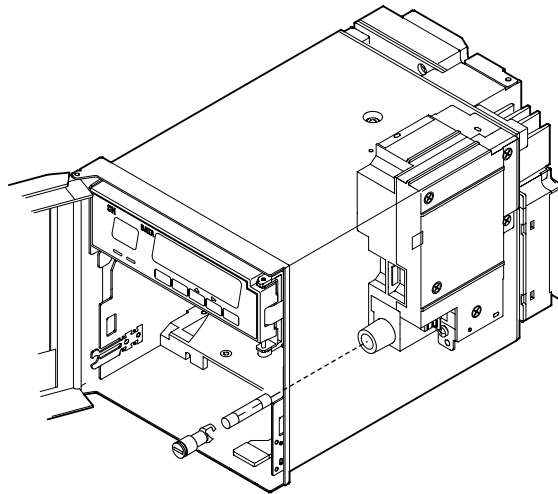
Replacing the lithium battery can be dangerous. Do not attempt to replace the battery; never disassemble the recorder for replacing the battery.

WARNING

4.8.3 Fuse Replacement

Replacing the fuse every two years is recommended as preventive maintenance. Replacing procedure is as follows:

- (1) Turn the power switch OFF.
- (2) Take out the chart cassette; the fuse holder is found in the main unit. Turn the fuse carrier counterclockwise to release it with the fuse.
- (3) Change the fuse with a new one, and insert the carrier to the fuse holder turning it clockwise for fixing.



Fuse Replacement

WARNING

- To protect against personal injury, turn the power switch OFF and disconnect the recorder from the main power line before replacing the fuse.
- To protect against an accident such as a fire, use only the specified fuse

Fuse part number:	A1360EF	
Original manufacturer:	Shelter	Littel
Original manufacturer's product code:	FST0034.524	313.500
Ratings:	250V AC T 0.5 A	250VACT 0.5 A
Recorders with a gray power switch		

Fuse part number:	A1512EF	
Original manufacturer:	wickmann-Werke GmbH	
Original manufacturers product code:	No.19195	
Ratings:	250V AC T0.8A	
Recorders with a white power switch		

4.8.4 Cleaning the Carriage Shafts

Pen model

To maintain proper recording functions, it is recommended to clean the plotter-carriage shaft once a year.

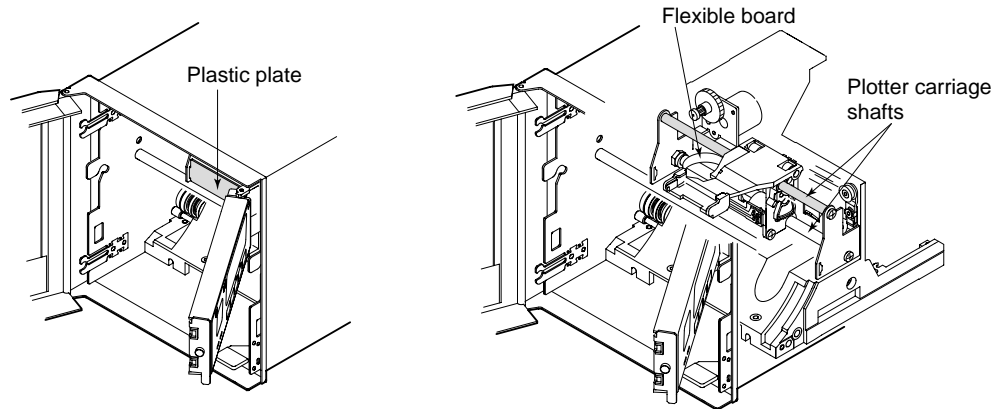
Cleaning procedure is shown below:

Wipe the two shafts, the upside and downside ones for the plotter carriage, with a piece of soft cloth or paper without fluffing.

If stains are persistent, use several drops of ethyl alcohol with the cloth or paper.

CAUTION

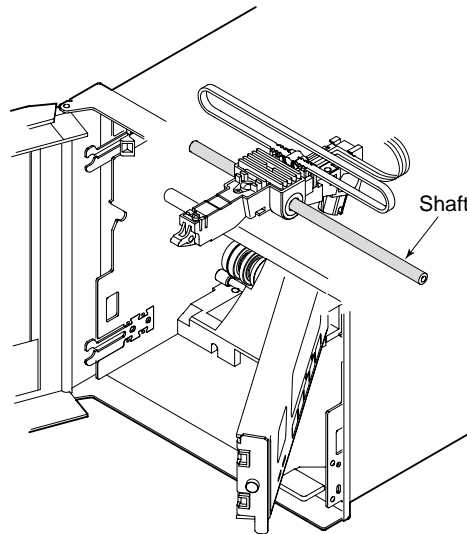
- Do not damage the plotter's flexible-printed circuit when cleaning the shafts.
- The shafts do not require lubricating oil.

**Dot-printing model**

To maintain proper recording functions, it is recommended to lubricate the printer-carriage shaft once a year.

Lubricating procedure is shown below:

- (1) Wipe up dust or oil from the shaft of the printer carriage with a piece of soft cloth or paper without fluffing.
- (2) Take out the tube of lubricating oil from among the spare parts.
- (3) Coat the shaft with a few small drops of lubricating oil, but remove excess oil with a piece of soft cloth or paper without fluffing.

**4.8.5 Calibration**

Calibration is a comparing operation between standard inputs and measured values. It is recommended to carry out a calibration once a year to assure the measuring accuracy.

Required instruments for calibration

The instruments for calibration should have the required resolution. If necessary, ask the sales office from whom you purchased the recorder about those instruments.

Recommended instruments

OMEGA model # CL511 calibrator

Calibration procedure

(1) Connect the instruments to the recorder; connecting the terminals is shown below. Give enough warm-up time to the instruments (more than 30 minutes for the recorder).

(2) Check that the ambient temperature and humidity are within the standard operating conditions.

Standard operating conditions

- Ambient temperature : $23 \pm 2^\circ\text{C}$
- Humidity : $55 \pm 10\%$ RH
- Power supply : 90 to 132 V AC, or 180 to 250 V AC
- Power frequency : $50/60 \text{ Hz} \pm 0.1\%$
- Warm-up time : 30 minutes or more
- Mechanical vibration : Within the range not affecting recorder operation

However, when the calibration is conducted under normal operating conditions (see subsection 4.8.6), check the accuracy influenced by the conditions.

Chart paper yields thermal expansion or shrinkage, sometimes resulting in differences from the calibrated values.

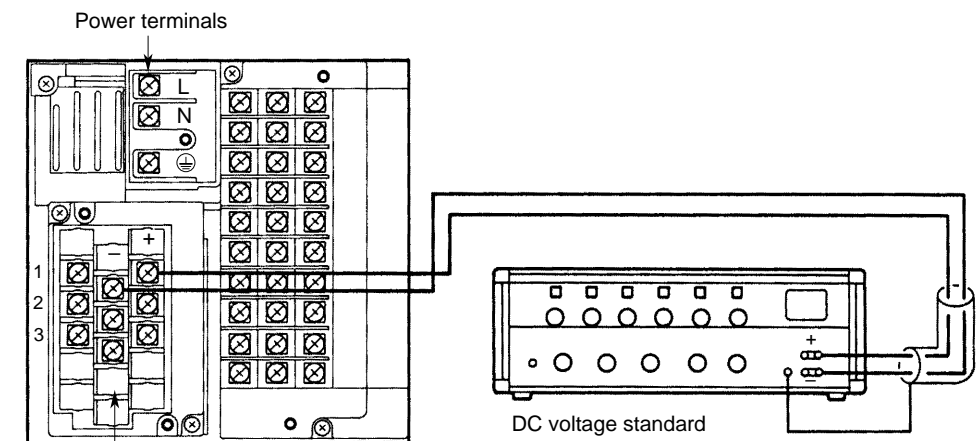
Examples of expansion are shown below assuming the reference temperature 20°C and humidity 65% RH:

- Expansion at 85% RH 0.4% or less
- Expansion at 35% RH 0.45% or less

(3) Input the standard signals equivalent to 0, 50, and 100% of the setting range of the recorder, then check the difference error between input signals and measured values.

If the error is not within the specified accuracy, contact OMEGA Engineering.

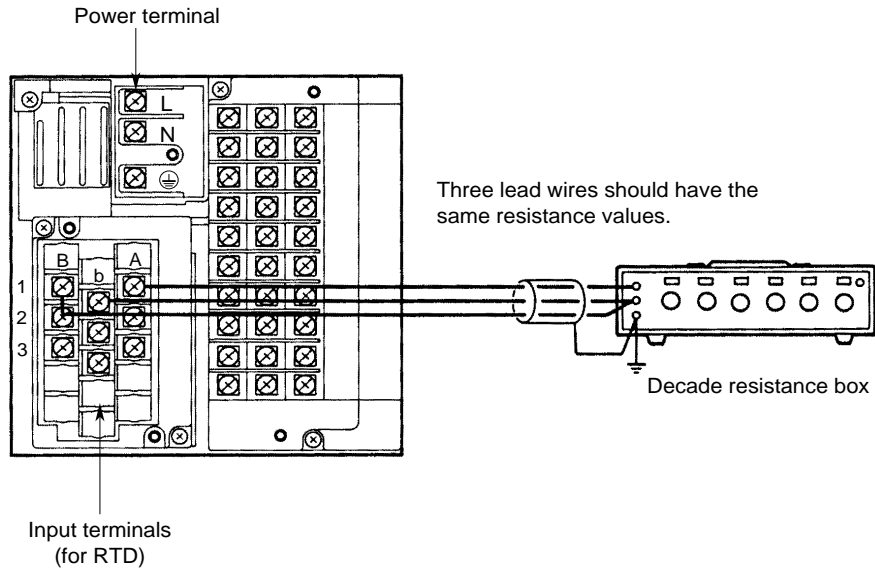
NOTE A reference input for a thermocouple (TC) signal needs temperature compensation; the temperature at the recorder input terminal should be measured to make voltage compensation (adding) due to the reference junction temperature compensation.



Input terminals
(for DC Voltage or TC)

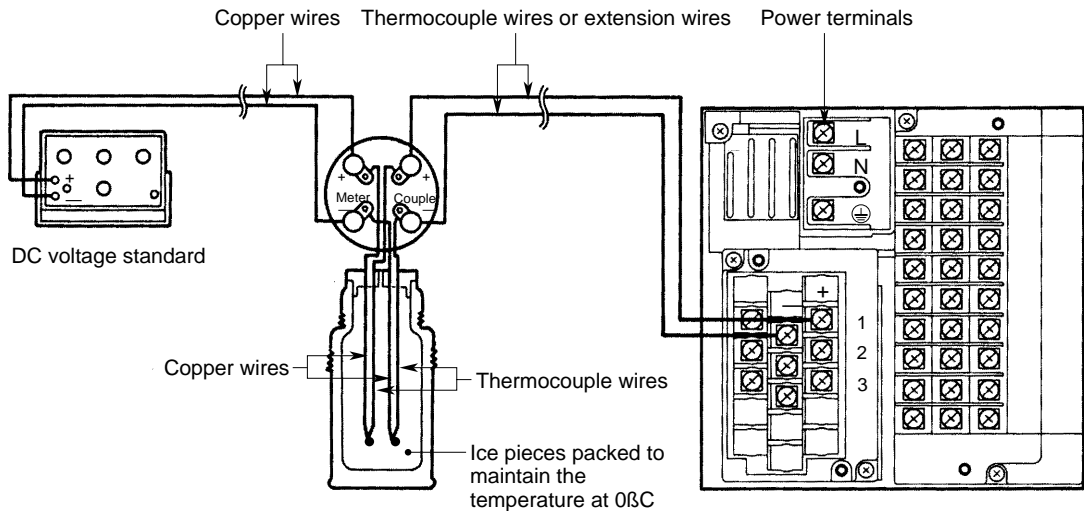
DC Voltage Signal for Pen model (same as Dot-printing model)

Temperature Measurement for Resistance Temperature Detector (RTD)



Temperature Signal as RTD for Pen model
 (for Dot-printing model, the wire connection exchanges between the terminal B and b.)

Temperature Compensation for Thermocouple Signal



(reference junction compensator Model TRCIII)

Reference Junction Compensation for Thermocouple Input

A DC voltage generated by a thermocouple differs from a value calculated from the table of thermo-electromotive force (EMF) because the table is based on the 0°C reference temperature but the temperature at the recorder input terminal is generally equal to the room temperature.

The recorder measures the temperature at the input terminal for compensation; when the input terminals are shorted (equivalent to 0°C of the thermocouple in the EMF table), the recorder indicates the temperature at the input terminal.

For calibrating a recorder, an input voltage after the compensation (after subtraction of the compensating voltage) should be applied to the recorder; an example is shown in (thTRCIII reference junction compensator is used).

Reference Temperature Compensating Connection for Pen model (same as Dot-printing model)

4.8.6 Pen-Position Adjustment (Pen model)

It is recommended to adjust pen positions on the chart at least once a year.

Adjusting procedure

(1) Turn the recorder power on and allow a warm-up time of more than 30 minutes.

(2) Check that the environmental conditions are within normal operating conditions.

Normal operating conditions

Power supply : 90 to 132 V AC, or 180 to 250 V AC

Power frequency : 50/60 Hz±2%

Ambient temperature : 0 to 50°C

Ambient humidity : 20 to 80% RH (under 5 to 40°C)

Mechanical vibration : 10 to 60 Hz, 0.2 m/s² or less

Mechanical shock : Not permitted

Magnetic field : 400 AT/m or less (DC and 50/60 Hz)

External noise : Normal mode (50/60 Hz)

DC voltage Noise peak value with signal is limited to 1.2 times larger value than the measuring range.

TC signal Noise peak value with signal is limited to 1.2 times larger value than the measuring thermoelectromotive force.

RTD signal 50 mV or less

Common mode noise (50/60 Hz): 250 V AC rms or less for any range

Maximum noise voltage between channels (50/60 Hz):

Pen model, Dot-printing model 250 V AC rms or less

Mounting inclination : Backward 0 to 30°

Chart paper yields thermal expansion or shrinkage, sometimes resulting in differences from the calibrated values. Adjust the pen position, if necessary.

Examples of expansion are shown below assuming the reference temperature 20°C and humidity 65% RH:

Expansion at 85% RH 0.4% or less

Expansion at 35% RH 0.45% or less

(3) To enter the SET UP mode, turn the power switch off, and turn on again while pressing the [CH UP] (←ENT) key.

(4) Select [P _ R d L] using the [△] key, and press the [ENT] key.

(5) Select [← L L L L] (leftward movement) or [R L L L] (rightward movement) using the [△] key, and press the [ENT] key.

NOTE Adjust the pen positions in the order of NULL to FULL.

(6) Select the number of the channel to be adjusted using the [△] key, and press the [ENT] key.

(7) The selected pen moves leftward (for NULL) or rightward (for FULL). Increase or decrease the setpoint value to make the pen accurately overlap the graduated line of the chart.

The setting consists of a number of five digits.

Select the digit by pressing the [▷] key, and select a numeral by the [△] key.

Setting range is 7950 to 11350 for NULL, 14500 to 19500 for FULL. Finally press the [ENT] key after all codes are entered.

The pen will move after pressing the [ENT] key. The pen movement corresponding to [1] is 0.0057 mm. Decreasing the numeral moves the pen leftward, and increasing moves the pen rightward.

NOTE If the [ENT] key is pressed while setting the numeric codes, the indication changes to [- 5 5 -], and the numeric codes already set remain valid. However, they will become invalid if the [ESC] key is pressed.

- (8) The indicator displays [- 5 E t -], and the pen will move to the adjusted position. Confirm the pen position and press the [ENT] key.
- (9) The indicator returns to [n U L L] or [F U L L]. When you want to carry out the position adjustment again, press the [ENT] key and carry out step (6) again. When another adjustments are required, select [n U L L] or [F U L L] again by pressing the [△] key. In order to finish the adjustment, press the [ESC] key to return to the [P _ R d U] indication.
- (10) Before leaving the SET UP mode, its contents should be stored.
Select [E n d] by pressing the [△] key, and press the [ENT] key.
- (11) Select [S t o r E] to keep setting values valid, or select [R b o r t] to abort them by pressing the [△] key, and press the [ENT] key.
The SET UP mode finishes, and several seconds after, the mode returns to the OPERATION mode.

4.8.7 Dot-Position Adjustment (Dot-printing model)

It is recommended to adjust the position of dots at least once a year.

Adjusting procedure

- (1) Turn the recorder power on and allow a warm-up time of more than 30 minutes.
- (2) Check that the environmental conditions are within normal operating ranges (see subsection 4.8.6).
- (3) To enter the SET UP mode, turn the power switch off, and turn on again while pressing the [CH UP] (←ENT) key.
- (4) Select [P _ H d L] by pressing the [△] key, and press the [ENT] key.
- (5) Select [← U L L] (leftward movement) or [→ U L L] (rightward movement) or [H Y S] (movement toward the center of dotted line) by pressing the [△] key, and press the [ENT] key.

NOTE Selection and adjustment should be made in the order of HYS→NULL→FULL.

- (6) First, the HYS should be adjusted. A zigzag line will be drawn in the center area of the chart. When the line is as Figure a, increase the set value, but in case of Figure b, decrease it.

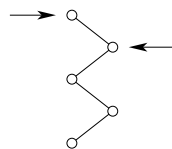


Figure a

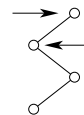


Figure b

The arrows show the moving direction of the printer head.

The setting consists of a number of five digits.

Select the digit by pressing the [▷] key, and select a numeral by the [△] key; the setting range is -7 to 7. Finally press the [ENT] key after all codes are entered.

The dot position movement corresponding to [1] is 0.1 mm.

NOTE If the [ENT] key is pressed while setting the numeric codes, the indication changes to [- S E L -], and the numeric codes already set stay valid. However, pressing the [ESC] key turns them invalid.

- (7) The indicator displays [- S E L -], and the dot carriage will move to the adjusted position. Confirm the dot carriage position and press the [ENT] key.
- (8) The indication returns to [H Y S] and recording stops. If the recording position is illegal, press the [ENT] key and repeat step (6); if correct, press the [△] key and select [← U L L] or [→ U L L].
- (9) Next, the NULL and FULL should be adjusted. Increase or decrease the setpoint value to make the dot position accurately overlap the graduated line of the chart. The setting consists of a number of five digits. The setting range is 1 to 15 for NULL, and 970 to 1030 for FULL. Finally press the [ENT] key after all codes are entered. The dot position movement corresponding to [1] is 0.1 mm. Decreasing the numeral moves the dot position leftward, and increasing moves it rightward.

NOTE If the **[ENT]** key is pressed while setting the numeric codes, the indication changes to [- 5 5 -], and the numeric codes already set stay valid. However, pressing the **[ESC]** key turns them invalid.

(10) The indicator displays [- 5 5 -], and the dot carriage will move to the adjusted position.

Confirm the dot carriage position and press the **[ENT]** key.

(11) The indication returns to [n U L L] or [F U L L]. When you want to carry out the position adjustment again, press the **[ENT]** key and carry out step (9) again. When another adjustments are required, select [n U L L], [F U L L] or [H Y S] again by pressing the [Δ] key. In order to finish the adjustment, press the **[ESC]** key to return to the [P _ A d J] indication.

(12) Before leaving the SET UP mode, its contents should be stored.

Select [E n d] by pressing the [Δ] key, and press the **[ENT]** key.

(13) Select [5 t o r 5] to keep setting values valid, or select [A b o r t] to abort them by pressing the [Δ] key, and press the **[ENT]** key.

The SET UP mode finishes, and several seconds after, the mode returns to the OPERATION mode.

Chapter 5 DATA SETTING GUIDES

This chapter describes the setting modes listed below.
Read this chapter before you enter settings for the first time.

- 5.1 Various Modes
 - 5.1.1 OPERATION Mode
 - 5.1.2 SET Mode
 - 5.1.3 SET UP Mode
- 5.2 Procedures to Enter Setting Data

5.1 Various Modes

The recorder has three modes which are described below:

OPERATION mode

This is the mode for daily operation; when the power turns on, the recorder automatically enters this mode. For details, see chapter 4 “DAILY OPERATION AND MAINTENANCE”.

SET mode

In this mode, daily-used data such as alarm setpoints, date, and time are set. Pressing the [DISP] key three seconds in the OPERATION mode changes the mode to the SET mode.

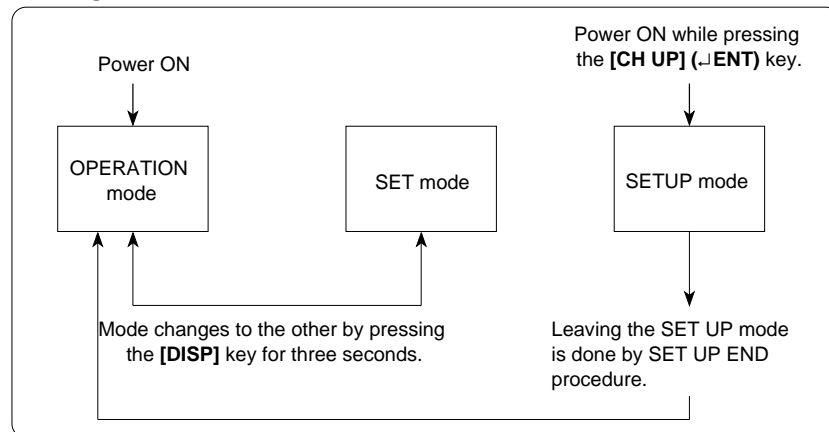
SET UP mode

In this mode, you make settings for digital printing, alarm, burnout function and others, also adjust the pen’s position or the position where the recorder prints dots. You can enter this mode by turning the power on while pressing the [CH UP] (←ENT) key.

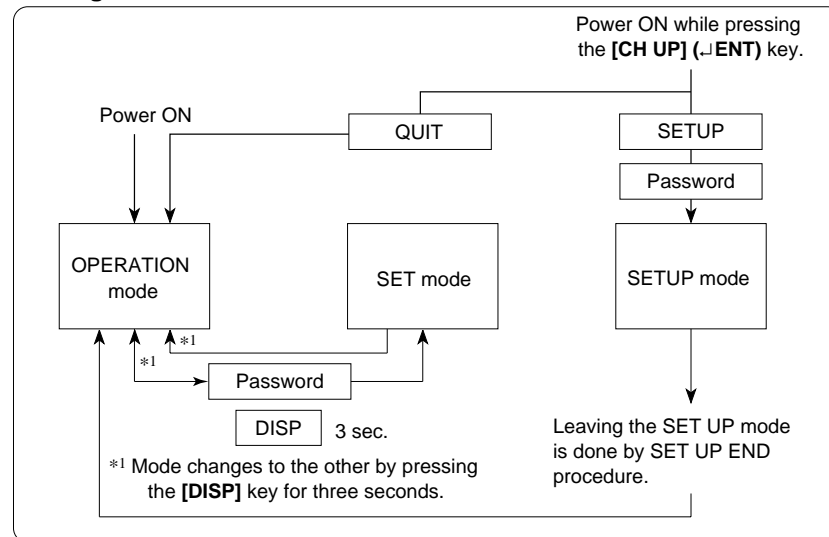
NOTE While in the SET UP mode, measurement, recording, and alarm detection are not carried out.

Using the SETTINGS PROTECTION FUNCTION, you can protect your settings by defining a password when you enter the SET or SET UP mode. For details on the settings protection function, see section 7.17.

Turning the function off:



Turning the function on:



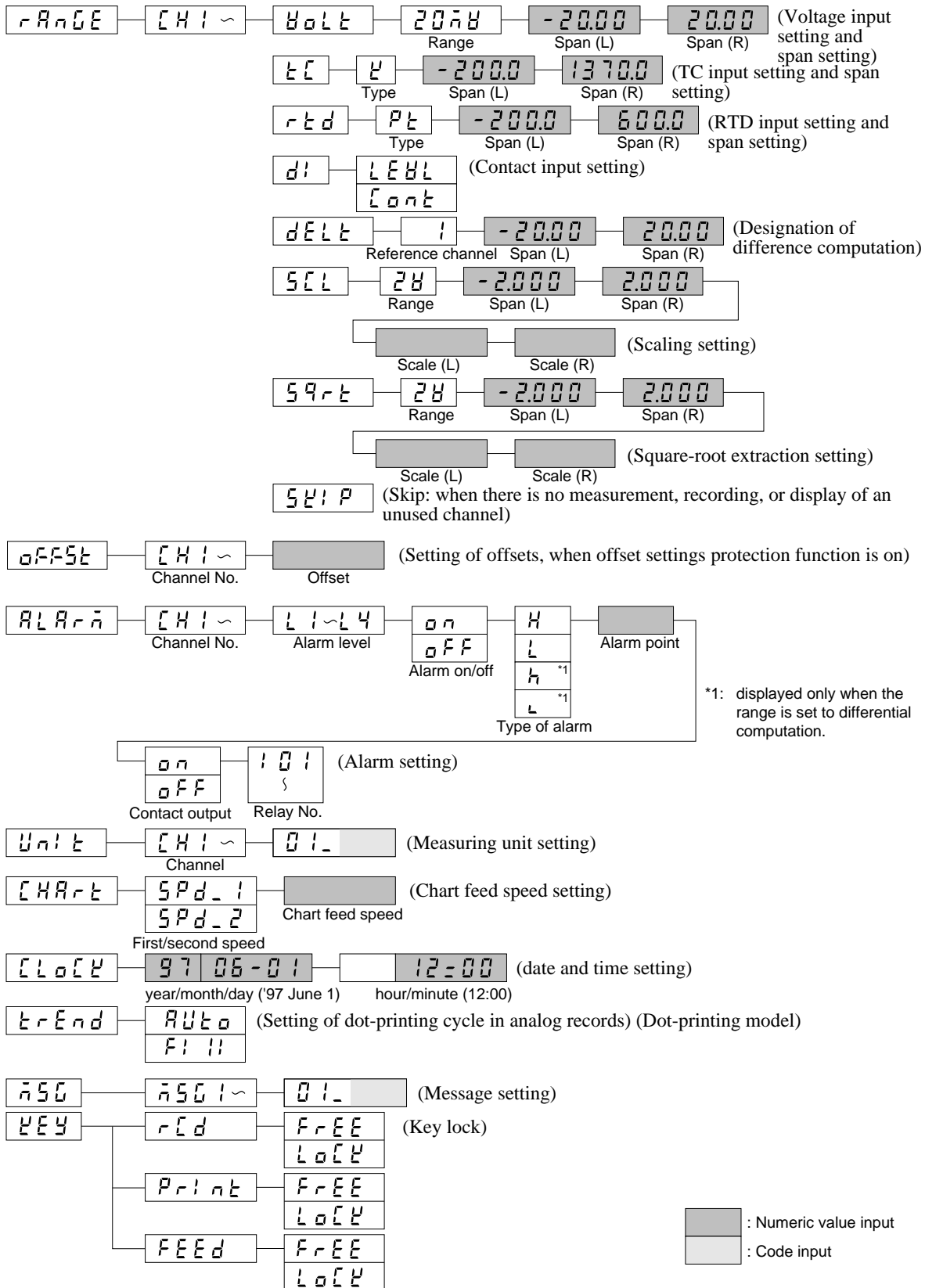
5.1.1 OPERATION Mode

Select from the following functions by pressing the appropriate keys on the key panel.

- [PRINT] key
- | | |
|---------|-----------|
| L I S t | S t A r t |
| | S t o P |
- (Start/stop of list printing—see subsection 4.6.1)
-
- | | |
|-----------|-----------|
| S L I S t | S t A r t |
| | S t o P |
- (Start/stop of SET UP list printing—see subsection 4.6.2)
-
- | | |
|-----------|-------|
| C _ P E n | Y E S |
| | n o |
- (Replacement of pens—Pen models only—see section 4.3)
-
- [DISP] key (Selection from the modes of display—see section 4.7)

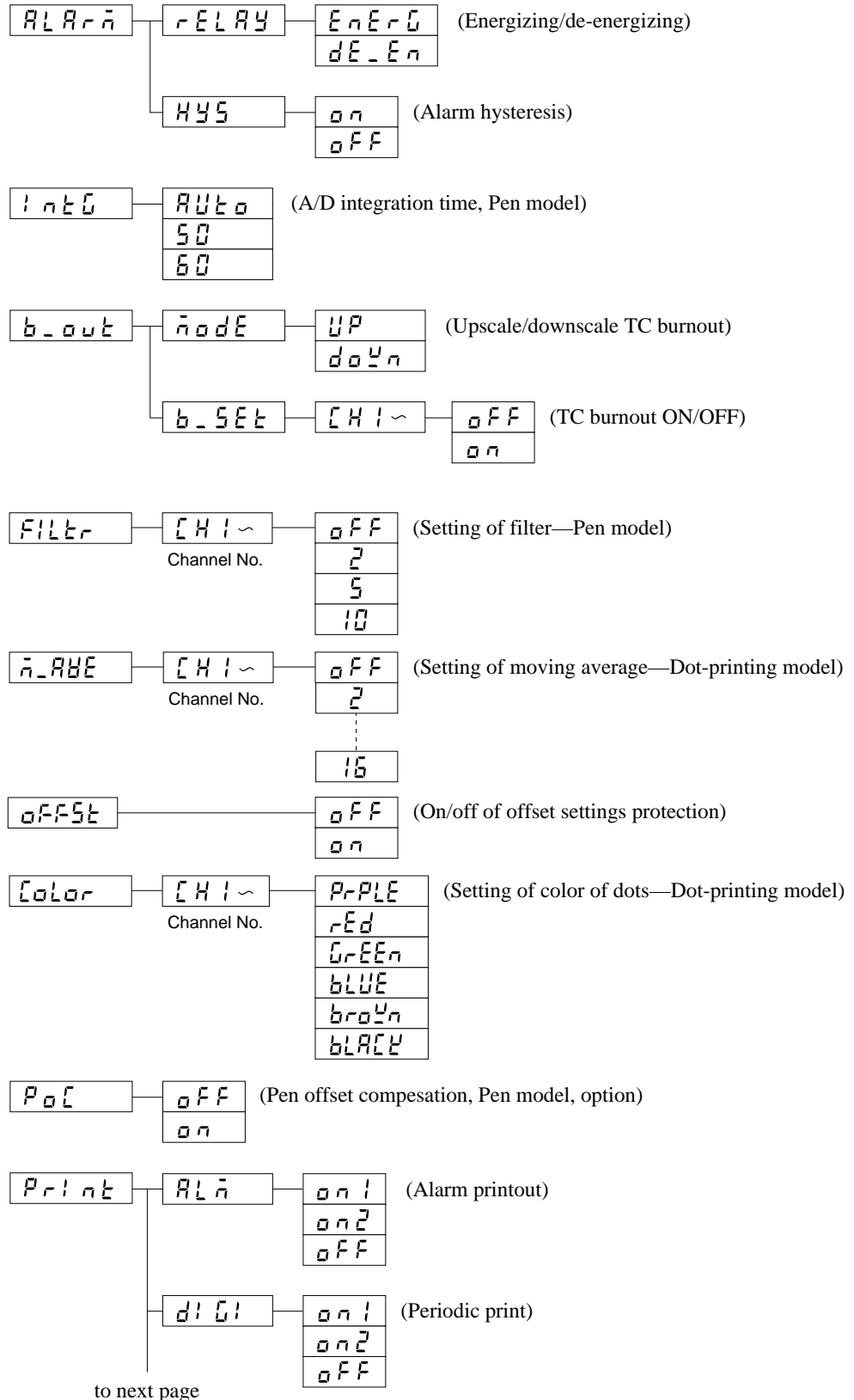
5.1.2 SET Mode

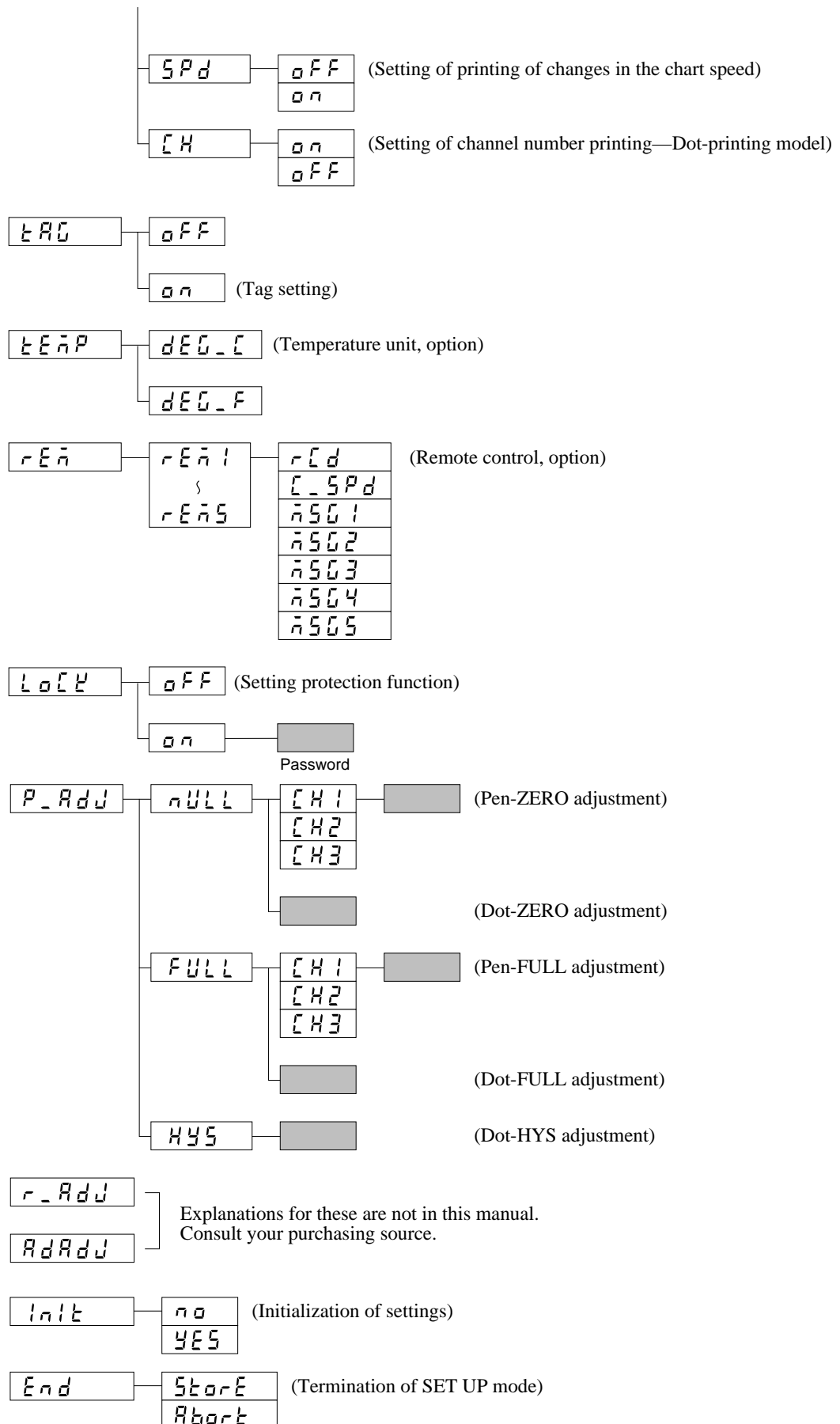
This flow can be entered by pressing the **[DISP]** key for three seconds.



5.1.3 SET UP Mode

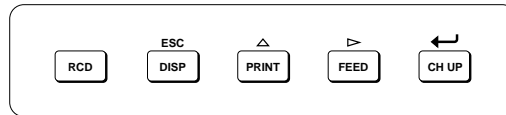
The SET UP mode can be entered by turning on the power while holding down the [CH UP] (← ENT) key.








5.2 Procedures to Enter Setting Data


Data setting is done by the four keys on the key panel which are referred to by the marks on the keys.



 **[ESC]** key : Cancels the already set data in the middle of a setting; after canceling, the previous indication will be shown on the indicator.

 **[△]** key : Selects parameters of any setting, or selects any numeric characters in case of ranges, alarms, offsets, date/time and so on.

 **[▷]** key : Moves the cursor to the next digit while entering parameters. Since there is no backspace key provided, this key will move to the first digit after the last digit.

 **[ENT]** key : Confirms a set value for entry. Pressing the key moves the indication to the next setting display.

NOTE While in the SET mode, [RCD] key is effective. Pressing [RCD] key starts or stops the recording.

Chapter 6 SET MODE

This chapter describes the setting procedures in the SET mode.

- 6.1 Setting Input Range and Recording Span (RANGE)
- 6.2 Setting Offsets (OFFST)
- 6.3 Setting Alarms (ALARM)
- 6.4 Assigning Units (UNIT)
- 6.5 Setting Chart Speed (CHART)
- 6.6 Setting Date/Time (CLOCK)
- 6.7 Adjusting the Trend Recording Format (TREND, Dot-printing model)
- 6.8 Assigning Tags (TAG)
- 6.9 Setting Message (MSG)
- 6.10 Setting Key Lock (KEY)

6.1 Setting Input Range and Recording Span (RANGE)

One of the following parameters can be set for every channel:

- SKIP** Prevents the specified channel from being measured, recorded and displayed .
- VOLT** Measures and records DC-voltage.
- TC** Measures and records temperatures using Thermocouple.
- RTD** Measures and records temperatures using Resistance Temperature Detector .
- DI** Accepts Digital Input (contact/voltage level) and performs ON/OFF recording.
- DELT** Performs difference computation between two channels which have same input range.
- SCL** Performs scaling on voltage measurements.
Scaling results in appending a different scale to the measured values.
- SQRT** Takes the square root ($\sqrt{\quad}$) of DC-voltage measured data.

NOTE Restrictions apply to the measurable types of input depending on the type of recorder used. Check your recorder type as indicated on the nameplate (see page 1-4 of the instruction manual for details on the nameplate), and then refer to the following table.

Model Code	Measurable Type of Input
SR100x-B-1	Voltage (VOLT), thermocouple (TC), contact (DI), SCL, SQRT
SR100x-B-2	Resistance temperature detector (RTD)

SKIP Setting

Unused channels can be skipped, which means that these channels will not be measured, recorded or displayed.

Key operation	Indication	Description
		Press the [DISP] key for three seconds to enter the SET mode. Select the [RANGE] display by using the [△] key. Then press the [ENT] key.
		Use the [△] key to select the desired channel. Press the [ENT] key.
		Use the [△] key to select [SKIP] . Press the [ENT] key.
		[RANGE] is displayed and the setting is completed. Press the [ENT] key to set another channel; or press the [DISP] key to three seconds to return to the OPERATION mode.

NOTE If you press the **[ESC]** key in the middle of setting, the indication returns to the **[RANGE]** and already set data will be aborted.

Voltage Measurement Setting (VOLT Setting)

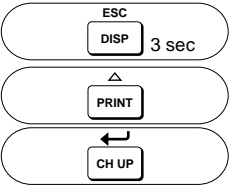
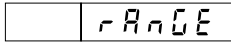
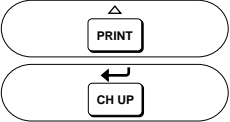
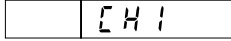
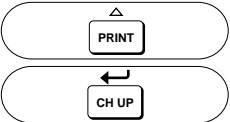
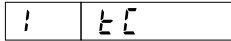
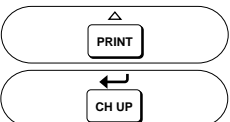
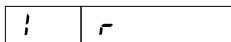
In the case that the measured signal is a DC-voltage, the range can be set as follows:

Key operation	Indication	Description														
		Press the [DISP] key for three seconds to enter the SET mode. Select the [r R n U E] display by using the [△] key. Then press the [ENT] key.														
		Use the [△] key to select the desired channel. Press the [ENT] key.														
		Use the [△] key to select [Volt]. Press the [ENT] key.														
		Select the desired range using the [△] keys and press the [ENT] key.														
<p>VOLT Input Ranges</p> <table border="1"> <thead> <tr> <th>Display</th> <th>Range</th> </tr> </thead> <tbody> <tr> <td>20mV</td> <td>-20.00 to 20.00mV</td> </tr> <tr> <td>60mV</td> <td>-60.00 to 60.00mV</td> </tr> <tr> <td>200mV</td> <td>-200.0 to 200.0mV</td> </tr> <tr> <td>2V</td> <td>-2.000 to 2.000V</td> </tr> <tr> <td>6V</td> <td>-6.000 to 6.000V</td> </tr> <tr> <td>20V</td> <td>-20.00 to 20.00V</td> </tr> </tbody> </table>			Display	Range	20mV	-20.00 to 20.00mV	60mV	-60.00 to 60.00mV	200mV	-200.0 to 200.0mV	2V	-2.000 to 2.000V	6V	-6.000 to 6.000V	20V	-20.00 to 20.00V
Display	Range															
20mV	-20.00 to 20.00mV															
60mV	-60.00 to 60.00mV															
200mV	-200.0 to 200.0mV															
2V	-2.000 to 2.000V															
6V	-6.000 to 6.000V															
20V	-20.00 to 20.00V															
		Select the minimum value of the recording span (SPAN L) using the [△] and [▷] keys. Then press the [ENT] key.														
		The display which appears will allow you to enter the maximum value of the recording span (SPAN R). Select it the same way as for the minimum value and press the [ENT] key. Note that the recording span cannot be beyond the input range, nor can SPAN L be equal to SPAN R.														
		[r R n U E] is displayed and the setting is completed. Press the [ENT] key to set another channel; or press the [DISP] key for three seconds to return to the OPERATION mode.														

NOTE If you press the [ESC] key in the middle of setting, the indication returns to the [r R n U E] and already set data will be aborted.

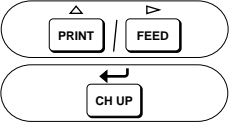

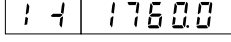

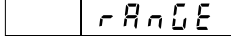
Thermocouple and Resistance Temperature Detector Setting (TC, RTD Setting)

In the case that the measured signal is a TC (Thermocouple) or RTD (Resistance Temperature Detector) the range can be set the same way as if it were a DC-voltage.

Key operation	Indication	Description
		Press the [DISP] key for three seconds to enter the SET mode. Select the [r R n C E] display by using the [△] key. Then press the [ENT] key.
		Use the [△] key to select the desired channel. Press the [ENT] key.
		Use the [△] key to select [t C], or [r t d]. Press the [ENT] key.
		Select the desired type (R, S, B, K, E, J, T, N, W, L, U in case of TC, or PT, JPT in case of RTD) using the [△] key and press the [ENT] key.

TC Type Description and RTD Type Description

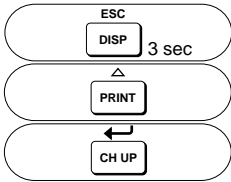
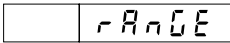
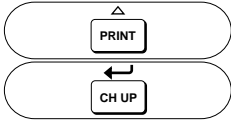
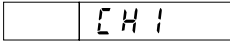
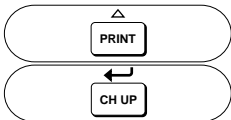
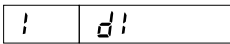
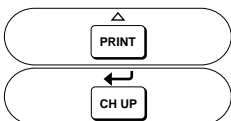
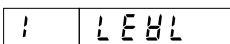
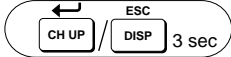
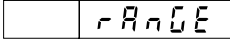
TC Type Description		RTD Type Description	
	Range		Range
r	0.0 to 1760.0°C 32 to 3200°F	P t	(pt100Ω) -200.0 to 600.0°C -328.0 to 1112.0°F
S	0.0 to 1760.0°C 32 to 3200°F	J P t	(Jpt100Ω) -200.0 to 550.0°C -328.0 to 1022.0°F
b	0.0 to 1820.0°C 32 to 3308°F		
W	-200.0 to 1370.0°C -328 to 2498.0°F		
E	-200.0 to 800.0°C -328.0 to 1472.0°F		
J	-200.0 to 1100.0°C -328.0 to 2012.0°F		
t	-200.0 to 400.0°C -328.0 to 752.0°F		
n	0.0 to 1300.0°C 32 to 2372°F		
W	0.0 to 2315.0°C 32 to 4199°F		
t (Fe-CuNi)	-200.0 to 900.0°C -328.0 to 1652.0°F		
J (Cu-CuNi)	-200.0 to 400.0°C -328.0 to 752.0°F		

	 	<p>Select the desired minimum value (SPAN L) and maximum value of the recording span (SPAN R) in the same way as described under 'VOLT setting'.</p> <p>Note that the recording span cannot be beyond the input range, nor can SPAN L be equal to SPAN R.</p>
		<p>[r R n C E] is displayed and the setting is completed. Press the [ENT] key to set another channel; or press the [DISP] key for three seconds to return to the OPERATION mode.</p>

NOTE If you press the [ESC] key in the middle of setting, the indication returns to the [r R n C E] and already set data will be aborted.

Digital Input Setting (DI Setting)

If a Digital Input (contact input/voltage level input) is being used, the setting can be done as follows:

Key operation	Indication	Description
		Press the [DISP] key for three seconds to enter the SET mode. Select the [r A n U E] display by using the [△] key. Then press the [ENT] key.
		Use the [△] key to select the desired channel. Press the [ENT] key.
		Use the [△] key to select [d | ]. Press the [ENT] key.
		There are two types, namely LEVEL and CONTACT. LEVL: (Level) Records ON/OFF status of a voltage input (0 to 2.4V is OFF (0), 2.4V and higher is ON (1)). CONT: (Contact) Records ON/OFF status of a contact (close is ON (1), open is OFF (0)). Select the desired type using the [△] key and press the [ENT] key.
		[r A n U E] is displayed and the setting is completed. Press the [ENT] key to set another channel; or press the [DISP] key for three seconds to return to the OPERATION mode.

- NOTE**
- The above mentioned selections will result in a recording trace from 0mm to 100mm between the contact statuses OFF and ON, which is from the extreme left side of the chart to the extreme right side.
 - If you press the [ESC] key in the middle of setting, the indication returns to the **[r A n U E]** and already set data will be aborted.

Difference Computation Setting (DELT Setting)

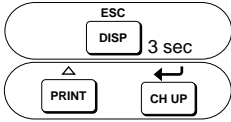
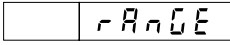
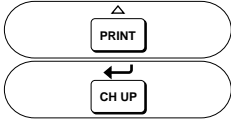
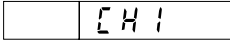
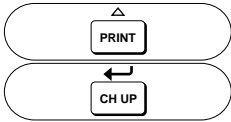
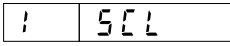
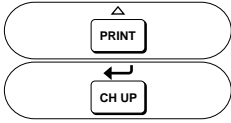
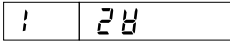
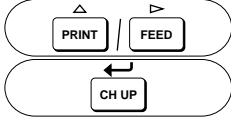
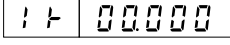
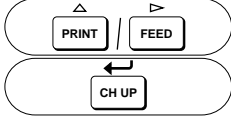
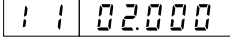
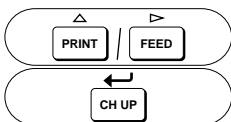
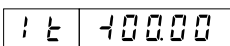
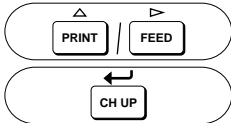
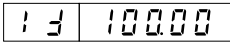

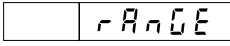
To obtain the difference between the measured values of two channels, proceed as follows.

Key Operation	Indication	Description
		Press the [DISP] key for three seconds to enter the SET mode. Select the [r R n C E] display by using the [△] key. Then press the [ENT] key.
		Use the [△] key to select the desired channel. Note that channel No.1 cannot be of the 'DELT' type. Press the [ENT] key.
		Use the [△] key to select [DELT] . Press the [ENT] key.
		The display which appears will allow you to enter a reference channel number. Note that the reference channel number must be lower than that of the channel being set. Therefore channel No.1 cannot be of the [DELT] type. Use the [△] key to select the desired reference channel number. Press the [ENT] key.
		In case of VOLT the display which appears will show the same minimum value of the recording span as of the reference channel. Use the [△] and [▷] keys to select the minimum value (SPAN L). Press the [ENT] key. Note that in case of VOLT, the input range of the DELT-channel must be within the range of the reference channel. In case of TC, RTD, the minimum/maximum span values can be found by taking the \pm value of the input range width. E.g. input range of TC type L = -200 to 900°C: minimum/maximum span values will be at ± 1100 °C. The difference in measured value from the reference channel will be recorded on the DELT-channel.
		The display which appears will show the same maximum value of the recording span as of the reference channel. Use the [△] and [▷] keys to select the maximum value (SPAN R) in the same way as described under 'SPAN L setting'. Note that SPAN L cannot be equal to SPAN R. Press the [ENT] key.
		[r R n C E] is displayed and the setting is completed. Press the [ENT] key to set another channel; or press the [DISP] key for three seconds to return to the OPERATION mode.

NOTE If you press the **[ESC]** key in the middle of setting, the indication returns to the **[r R n C E]** and already set data will be aborted.

Scale Setting (SCL Setting)

To assign a different scale to the measured data, the range can be set as described below. Note that the measured data which can get a different scale must be of the voltage (VOLT). To assign a unit to this new scale, see section 6.4.

Key operation	Indication	Description
		Press the [DISP] key for three seconds to enter the SET mode. Select the [r R n C E] display by using the [△] key. Then press the [ENT] key.
		Use the [△] key to select the desired channel. Press the [ENT] key.
		Use the [△] key to select [SCL] . Press the [ENT] key.
		Select the desired range (using the [△] key) and press the [ENT] key.
		The display which appears will allow you to enter the minimum value of the recording span (SPAN L). Select the desired minimum value using the [△] and [▷] keys. Then press the [ENT] key.
		The display which appears will allow you to enter the maximum value of the recording span (SPAN R). Select it the same way as the minimum value and press the [ENT] key. Note that SPAN L and SPAN R cannot be same.
		This display allows you to enter the minimum value of the scale (SCL L) corresponding to the minimum value of the recording span (SPAN L). Select it using the [△] and the [▷] keys. The position of the decimal point can be moved using the [△] key in case [.] is flashing. Note that the allowable range is -19999 to 20000. Then press the [ENT] key.
		This display allows you to enter the desired maximum value of the scale (SCL R) corresponding to the maximum value of the recording span (SPAN R). Select it the same way as the minimum value. Then press the [ENT] key. Note that the decimal point will be in the same position as for SCL L. SCL L and SCL R cannot be same.
		[r R n C E] is displayed and the setting is completed. Press the [ENT] key to set another channel; or press the [DISP] key for three seconds to return to the OPERATION mode.

NOTE

- In this example, 0.000V input will be scaled to -100.0. 2.000V input will be scaled to 100.0.
- If you press the **[ESC]** key in the middle of setting, the indication returns to the **[r R n C E]** and already set data will be aborted.

Setting to Obtain Square Root (SQRT Setting)

To obtain the square root of the measured value, proceed as follows:

Note that the measured data of which the square root can be taken, can only be of the voltage type. To assign a unit, see section 6.4.

Key operation	Indication	Discription
		Press the [DISP] key for three seconds to enter the SET mode. Select the [r R n G E] display by using the [△] key. Then press the [ENT] key.
		Use the [△] key to select the desired channel. Press the [ENT] key.
		Use the [△] key to select [5 9 r t]. Press the [ENT] key.
		Select the desired range (using the [△] key) and press the [ENT] key.
		The display which appears will allow you to enter the minimum value of the recording span (SPAN L). Select the desired minimum value using the [△] and [▷] keys. Then press the [ENT] key.
		The display which appears will allow you to enter the maximum value of the recording span (SPAN R). Select it the same way as for the minimum value and press the [ENT] key. Note that SPAN L and SPAN R cannot be same.
		This display allows you to enter the minimum value of the scale (SCL L) corresponding to the minimum value of the recording span (SPAN L). Select it using the [△] and the [▷] keys. The position of the decimal point can be moved using the [△] key in case [.] is flashing. Note that the allowable range is -1999 to 2000. Then press the [ENT] key.
		This display allows you to enter the maximum value of the scale (SCL R) corresponding to the maximum value of the recording range (SPAN R). Select it the same way as for the minimum value. Then press the [ENT] key. Note that the decimal point will be in the same position as for SCL L. SCL L and SCL R cannot be same.
		[r R n G E] is displayed and the setting is completed. Press the [ENT] key to set another channel; or press the [DISP] key for three seconds to return to the OPERATION mode.

NOTE If you press the [ESC] key in the middle of setting, the indication returns to the [r R n G E] and already set data will be aborted.

EXPLANATION OF SQUARE ROOT:

This recorder uses the following square rooting-method:

Let us define the items as follows:

V_{min} = minimum value of recording span (SPAN L)

V_{max} = maximum value of recording span (SPAN R)

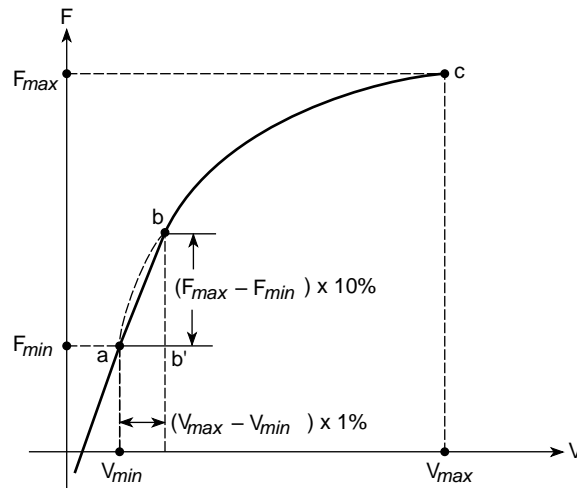
F_{min} = minimum value of scale (SQRT SCL L)

F_{max} = maximum value of scale (SQRT SCL R)

V_x = input voltage

F_x = scaling value

The relationship between V_x (input voltage) and F_x (scaling value) is as shown in the graph below (the graph configuration is approximate).



Between b and c in the graph, the following relation exists between F_x and V_x :

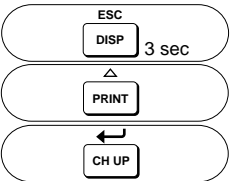
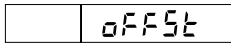
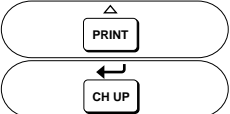
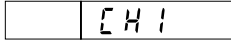
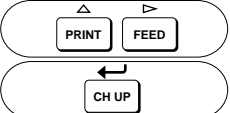
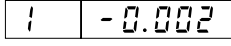

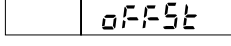
$$F_x = (F_{max} - F_{min}) \sqrt{\frac{V_x - V_{min}}{V_{max} - V_{min}}} + F_{min}$$

And between a and b, the relation is:

$$F_x = \frac{10 (F_{max} - F_{min})}{V_{max} - V_{min}} (V_x - V_{min}) + F_{min}$$

6.2 Setting Offsets (OFFST)

When recording and showing data using the current input as the reference, measured values can be corrected within 10% of the span. For example, assume the reading is 1.998 V for the current level of input. If you want to change the reading to 2.000 V, set 0.002 V as the offset. This menu opens only when offset settings protection is turned on in the SET UP mode.

Key operation	Indication	Discription
		Enter the SET mode by pressing the [DISP] key for three seconds. Using the [△] key, show [OFFST] and then press the [ENT] key.
		Using the [△] key, select the channel to be configured and then press the [ENT] key. Configurable channels are those whose measuring range is VOLT, TC, RTD or SCL.
		Type the value of offset. Use the [▷] key to move through the digits and the [△] key to select a numeral. When setting is complete, press the [ENT] key. Note that set the offset within 10% of the recording span or scale.
		[OFFST] is displayed and the setting is then completed. Press the [ENT] key to set another channel; or press the [DISP] key for three seconds to return to the OPERATION mode.

NOTE If you press the **[ESC]** key in the middle of setting, the indication returns to the **[OFFST]** and already set data will be aborted.

6.3 Setting Alarms (ALARM)

Alarms can be set on the measured data of any channel.

Up to four alarms (i.e. four levels) can be set on one channel.

After setting an alarm, and the measured value reaches the setpoint, the ALM LED will be illuminated and an alarm printout will be made on the chart. (see subsection 4.5.3)

H : High alarm

Occurs when a measuring value is over the alarm setpoint.

L : Low alarm

Occurs when a measuring value is under the alarm setpoint.

h : Difference high-limit alarm

Alarm is generated when the difference between the measured values of two channels is more than the alarm setting. (This type of alarm can only be set when the corresponding channel is of the DELT-type.)

l : Difference low-limit alarm

Alarm is generated when the difference between the measured values of two channels is less than the alarm setting. (This type of alarm can only be set when the corresponding channel is of the DELT-type.)

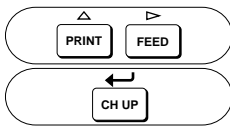
Key operation	Indication	Description
	ALArn	Enter the SET mode by pressing the [DISP] key for three seconds. Select [ALArn] by pressing the [Δ] key, and press the [ENT] key.
	CH1	Select a channel by the [Δ] key, and press the [ENT] key.
	1 L1	Select an alarm level by the [Δ] key, and press the [ENT] key. Up to four levels can be set.
	11 ON	Select ON/OFF of the alarm settings by the [Δ] key, and press the [ENT] key. Setting [OFF] shows [ALArn] and ends this setting.
	11 H	Select a type of alarms by the [Δ] key, and press the [ENT] key.

NOTE Alarm settings are automatically canceled on the affected channel, when any of the following changes occur:

- the input type (VOLT, TC, etc.) or input range (2 V, etc.) is changed.
- decimal point for scaling and square root setting is changed.
- minimum or maximum value of the recording span is changed (in case of scaling and square root setting).
- minimum or maximum value of the scale is changed (in case of scaling and square root setting).

Difference alarm setting (h , l) are canceled when any of the following changes occur:

- the reference channel is changed.
- the input type or range of the reference channel is changed.



11 -2.000

The display which appears will allow you to enter the alarm value.

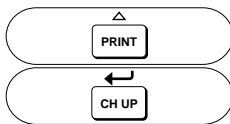
Set the alarm value using the [\triangle] and [\triangleright] keys. After setting, press the [ENT] key.

The decimal point is predetermined by the input range.

Relationship between Input Range and Decimal Points

Type of Input	Position of Decimal Point	
DC Voltage	-20.00 to 20.00 mV	XXX. XX
	-60.00 to 60.00 mV	XXX. XX
	-200.0 to 200.0 mV	XXXX. X
	-2.000 to 2.000 V	XX. XXX
	-6.000 to 6.000 V	XX. XXX
-20.00 to 20.00 V	XXX. XX	
Thermocouple/RTD (°C)	XXXX. X	

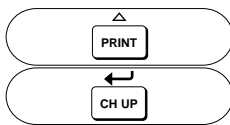
The following settings are available only for the model with relay options (A2/A4/A6). For models without these options, the alarm setting ends by pressing the [ENT] key until [ALARM] appears.



11 ON

Determines whether the relay outputs a signal or not when an alarm occurs.

Select ON/OFF by the [\triangle] key, and press the [ENT] key.



11 101

Sets the number of the relay after the alarm output ON is selected. A numeric to be set is selected from I01 to I06 by the [\triangle] key. Then press the [ENT] key.

NOTE If a number larger than the available number of output relays is selected, the alarm output will not implemented.



ALARM

[ALARM] is displayed and the setting is completed. Press the [ENT] key to set another channel; or press the [DISP] key for three seconds to return to the OPERATION mode.

- NOTE**
- As a merged function, a combination of remote control option (- R) and alarm output relay option is available to change the chart speed when an alarm occurs.
 - If you press the [ESC] key in the middle of setting, the indication returns to the [ALARM] and already set data will be aborted.

6.4 Assigning Units (UNIT)

When you are using scaling (SCL) or the square root setting (SQRT), it is possible to assign a different unit to the scales. Units will appear in the periodic printout. Up to six characters can be set.

The initial value is all spaces. To set, proceed as follows:

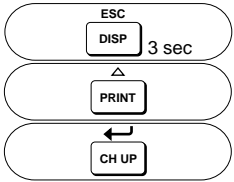
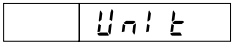
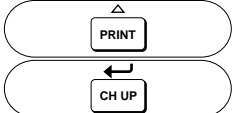
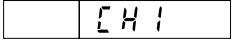
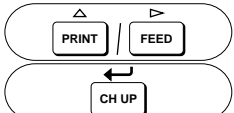
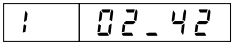
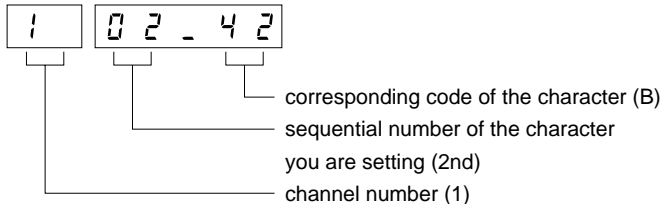

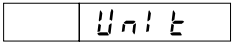
Key operation	Indication	Discription
		Press the [DISP] key for three seconds to enter the SET mode. Select the [Unit] display by using the [△] key. Then press the [ENT] key.
		Specify the desired channel using the [△] key, and press the [ENT] key. If the selected channel is not of the SCL or SQRT-type, data entry will be ignored.
		The maximum six characters of the unit can be set by the described code (Example is given in parentheses).
		
		<p>The code number can be selected using the [△] key. After setting both numbers of a code, press the [▷] key and the sequential number of the to be set character will go up one. After setting, press the [ENT] key.</p> <p>[Unit] is displayed and the setting is completed. Press the [ENT] key to set another channel; or press the [DISP] key for three seconds to return to the OPERATION mode.</p>

Table of characters code.

	0	1	2	3	4	5	6	7	8
0			S/P	0		P		p	
1				1	A	Q	a	q	
2				2	B	R	b	r	
3			#	3	C	S	c	s	
4				4	D	T	d	t	
5			%	5	E	U	e	u	
6				6	F	V	f	v	
7				7	G	W	g	w	
8			(	8	H	X	h	x	
9			)	9	I	Y	i	y	
A			*		J	Z	j	z	
B			+		K		k		
C					L	μ	l		
D			-		M		m		
E			.		N	Ω	n		
F			/	°	O		o	∅	

S/P means 'SPACE'.

NOTE

If you press the **[ESC]** key in the middle of setting, the indication returns to the **[Unit]** and already set data will be aborted.

6.5 Setting Chart Speed (CHART)

Chart Speed (unit: mm/h)

10	15	20	25	30	40	50	60	75	80
90	100	120	150	160	180	200	240	300	360
375	450	600	720	750	900	1200	1500	1800	2400
3000	3600	4500	4800	5400	6000	7200	9000	10800	12000

The data for a dot-printing model (10 mm/h to 1500 mm/h) are shown within the bold border.

Key operation	Indication	Description
		Press the [DISP] key for three seconds to enter the SET mode, and select [CHART] using the [△] key. Then press the [ENT] key.
		Using the [△] key, select one of the two kinds of chart speed, the No.1 and No.2 chart speeds. Then press the [ENT] key.

NOTE The No.2 chart speed identifies the chart speed which takes effect in case the speed is changed by remote control (optional function).
For models without the remote control function, the setting of the No.2 chart speed is invalid.

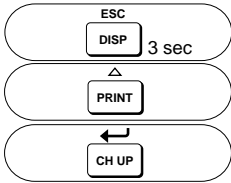
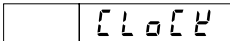
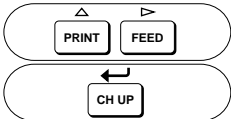
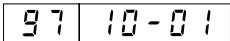
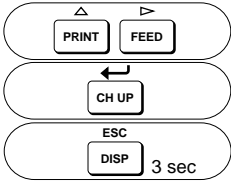
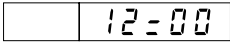
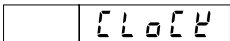
		Select a numeric code referring to the table above using the [△] key and press the [ENT] key.
--	--	---

NOTE Digital printing will not be carried out when the chart speeds are:
120 mm/h or more for a dot-printing model
When a pen model uses a fast chart speed such as 600 mm/h to 1500 mm/h, the position error of the time tick of a periodic printout may become as large as 2 cm for 1500 mm/h.

		[CHART] is displayed and the setting is completed. Press the [ENT] key to set another channel; or press the [DISP] key for three seconds to return to the OPERATION mode.
--	--	---

NOTE If you press the **[ESC]** key in the middle of setting, the indication returns to the **[CHART]** and already set data will be aborted.

6.6 Setting Date/Time (CLOCK)

Key operation	Indication	Description
		Press the [DISP] key for three seconds to enter the SET mode, and select [C L O C K] by pressing the [△] key. Then press the [ENT] key.
		First, set the year, month and day. The two digits on the left side of the display indicate the year. The five digits on the right side of the display indicate the month and day. After finishing the setting, press the [ENT] key.
	 	Set the hour and minutes. After finishing, press the [ENT] key. The seconds will be automatically set to 0. [C L O C K] is displayed and the setting is completed. Press the [ENT] key to set another channel; or press the [DISP] key for three seconds to return to the OPERATION mode.

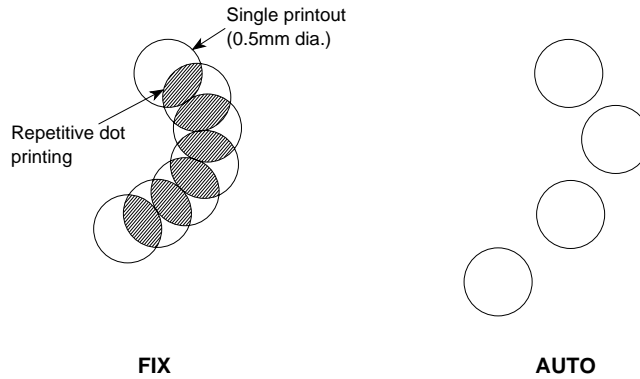
NOTE If you press the **[ESC]** key in the middle of setting, the indication returns to the **[C L O C K]** and already set data will be aborted.

6.7 Adjusting the Trend Recording Format (TREND, Dot-printing model)

This recorder prints in FIX or AUTO mode.

In FIX mode, dot printing is performed with a constant interval regardless of the chart speed (approx. 20 sec).

AUTO mode is provided to prevent the chart from being damaged during repetitive dot printing. This mode is useful for low chart speeds. The chart is protected from damage because the printout timing changes with the chart speed (approx. 20 to 90 sec).



The initial value is 'AUTO'. To set the trend recording mode, proceed as follows:

Key Operation	Indication	Discription
<div style="border: 1px solid black; border-radius: 15px; padding: 5px; display: inline-block; margin-bottom: 5px;"> ESC DISP 3 sec </div> <div style="border: 1px solid black; border-radius: 15px; padding: 5px; display: inline-block; margin-bottom: 5px;"> △ PRINT </div> <div style="border: 1px solid black; border-radius: 15px; padding: 5px; display: inline-block; margin-bottom: 5px;"> ← CH UP </div>	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> t r E n d </div>	Press the [DISP] key for three seconds to enter the SET mode. Select the [t r E n d] display using the [△] key, and press the [ENT] key.
<div style="border: 1px solid black; border-radius: 15px; padding: 5px; display: inline-block; margin-bottom: 5px;"> △ PRINT </div> <div style="border: 1px solid black; border-radius: 15px; padding: 5px; display: inline-block; margin-bottom: 5px;"> ← CH UP </div>	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> A U t o </div>	Specify AUTO or FIX using the [△] key. Then press the [ENT] key.
<div style="border: 1px solid black; border-radius: 15px; padding: 5px; display: inline-block;"> ← / ESC CH UP / DISP 3 sec </div>	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> t r E n d </div>	[t r E n d] is displayed and the setting is completed. Press the [DISP] key for three seconds to return to the OPERATION mode.

NOTE If you press the **[ESC]** key in the middle of setting, the indication returns to the [t r E n d] and already set data will be aborted.

6.8 Assigning Tags (TAG)

The following setting enables you to set tags to be recorded instead of the usual channel numbers. Tag will appear in the periodic printout, channel printout (Dot-printing model) and in the alarm printout. One tag can be set for every channel. The maximum length is seven characters. The initial value is all spaces.

Key operation	Indication	Discription
		Press the [DISP] key for three seconds to enter the SET mode. Select the display by using the [△] key. Then press the [ENT] key.
		Specify the desired channel using the [△] key, and press the [ENT] key. If there are no tags set in the SET UP mode, data entry will be ignored.
		The maximum seven characters of the tag can be set by the described code (Example is given in parentheses).
		The code number can be selected using the [△] key. After setting both numbers of a code, press the [▷] key and the sequential number of the to be set character will go up one. After setting, press the [ENT] key.
		is displayed and the setting is completed. Press the [ENT] key to set another channel; or press the [DISP] key for three seconds to return to the OPERATION mode.

Table of characters code.

	0	1	2	3	4	5	6	7	8
0			S/P	0		P		p	
1				1	A	Q	a	q	
2				2	B	R	b	r	
3			#	3	C	S	c	s	
4				4	D	T	d	t	
5			%	5	E	U	e	u	
6				6	F	V	f	v	
7				7	G	W	g	w	
8			(	8	H	X	h	x	
9			)	9	I	Y	i	y	
A			*		J	Z	j	z	
B			+		K		k		
C					L	μ	l		
D			-		M		m		
E			.		N	Ω	n		
F			/	°	O		o	∅	

S/P means 'SPACE'.

NOTE

If you press the **[ESC]** key in the middle of setting, the indication returns to the and already set data will be aborted.

6.9 Setting Messages (MSG)

The following setting enables you to set the messages. Up to five messages can be set, each of up to 16 characters. Printing out messages can only be done with the use of the remote control option (-R), with which your recorder must be equipped. Messages can not be printed out without this option.

Note that the printing of the messages will not be done when the chart speed is faster than 1500 mm/h (Pen model) or 100 mm/h (Dot-printing model) or when recording is OFF.

To set a message, proceed as follows:

Key operation	Indication	Description
		Press the [DISP] key for three seconds to enter the SET mode. Select the [7 5 0] display using the [△] key, and press the [ENT] key.
		The display which appears will prompt you to specify which message you want to set. Up to five messages can be set. Use the [△] key to specify message number and press the [ENT] key.
		The maximum sixteen characters of the message can be set by the described code (Example is given in parentheses).
		corresponding code of the character (B) sequential number of the character you are setting (2nd)
		The code number can be selected using the [△] key. After setting both numbers of a code, press the [▷] key and the sequential number of the to be set character will go up one. After setting, press the [ENT] key.
		[7 5 0] is displayed and the setting is completed. Press the [ENT] key to set another message; or press the [DISP] key for three seconds to return to the OPERATION mode.

Table of characters codes.

	0	1	2	3	4	5	6	7	8
0			S/P	0	P		p		
1				1	A	Q	a	q	
2				2	B	R	b	r	
3			#	3	C	S	c	s	
4				4	D	T	d	t	
5			%	5	E	U	e	u	
6				6	F	V	f	v	
7				7	G	W	g	w	
8			(	8	H	X	h	x	
9			)	9	I	Y	i	y	
A			*		J	Z	j	z	
B			+		K		k		
C					L	μ	l		
D			-		M		m		
E			.		N	Ω	n		
F			/	°	O		o	∅	

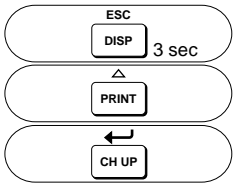
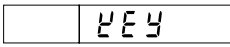
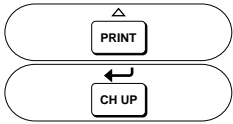
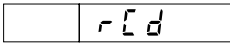
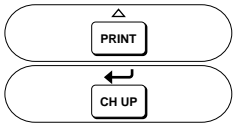
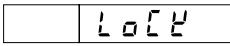

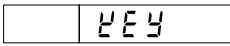
S/P means 'SPACE'.

NOTE

- If your recorder is equipped with the -R option, and you want them to be triggered by remote control, the messages must be assigned to the -R terminals.
- If you press the **[ESC]** key in the middle of setting, the indication returns to the **[7 5 0]** and already set data will be aborted.

6.10 Setting Key-lock (KEY)

The key-lock can be set to be either on or off for each key separately. Keys which can be locked are the [RCD], [PRINT], and [FEED] keys.

Key operation	Indication	Discription
		Press the [DISP] key for three seconds to enter the SET mode. Select the [KEY] display using the [△] key, and press the [ENT] key.
		Select a key to be locked using the [△] key and press the [ENT] key.
		Select [Lo[] to turn the key-lock on or select [Fr[] to turn it off, using the [△] key and press the [ENT] key.
		[KEY] is displayed and setting is completed. Press the [ENT] key to set another key; or press the [DISP] key for three seconds to return to the Operation mode.

NOTE If you press the [ESC] key in the middle of setting, the indication returns to the [KEY] and already set data will be aborted.

Chapter 7 SET UP MODE

This chapter describes the Set Up Mode.

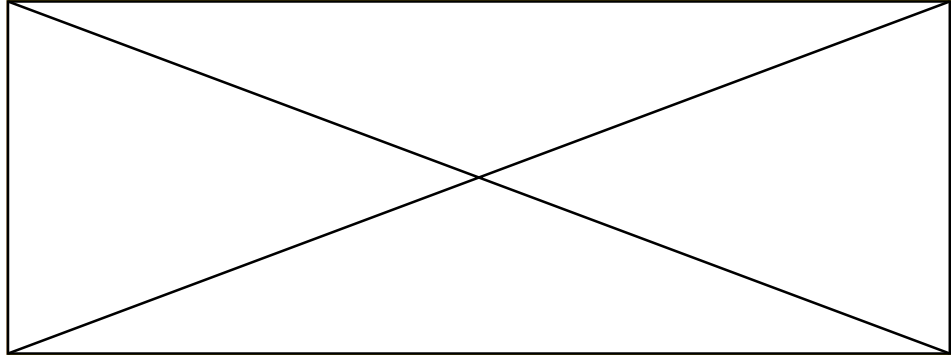
- 7.1 Setting the Output Relay to Energize/De-energize Upon Alarm (option)
- 7.2 Setting Alarm Hysteresis On/Off
- 7.3 Setting the A/D Integration Time (Pen model)
- 7.4 Setting Upscale/Downscale TC Burnout
- 7.5 Configuring the Input Filter (Pen Model)
- 7.6 Setting for Moving Average Calculations (Dot-printing model)
- 7.7 Turning Offset Settings Protection On/Off
- 7.8 Assigning Different Colors to Channels (Dot-printing model)
- 7.9 Setting Pen Offset Compensation On/Off (Pen model, /D1 option)
- 7.10 Turning Alarm Printing On/Off
- 7.11 Setting Periodic Printout On/Off
- 7.12 Turning Printing of Changes in Chart Speed On/Off
- 7.13 Turning Printing of Channel Numbers On/Off (Dot-printing model)
- 7.14 Selecting channel Number or Tag
- 7.15 Changing the Temperature Unit (/D2 option)
- 7.16 Changing Default Settings for REMOTE Operation (option)
- 7.17 Turning the Setting Protection Function On/Off
- 7.18 Initializing Settings

7.1 Setting the Output Relay to Energize/De-energize Upon Alarm (option)

NOTE The following settings are available only for the model with relay options (A1/A2/A3).

The alarm output relays can be selected to be energizing or de-energizing on alarm. Using de-energizing, alarm output relay is activated either when an alarm occurs, or when power off occurs (common for all relays). This enables simple monitoring of power supply.

The initial value is 'ENERG'.



SETTING PROCEDURE:

Enter the SET UP mode by turning 'ON' the power while pressing and holding the [CH UP] (←ENT) key until the SET UP display appears.

Use the [F1] key to select the display [F1]. Press the [ENT] key.

Press the [F2] key until the display [F2] appears. Press the [ENT] key.

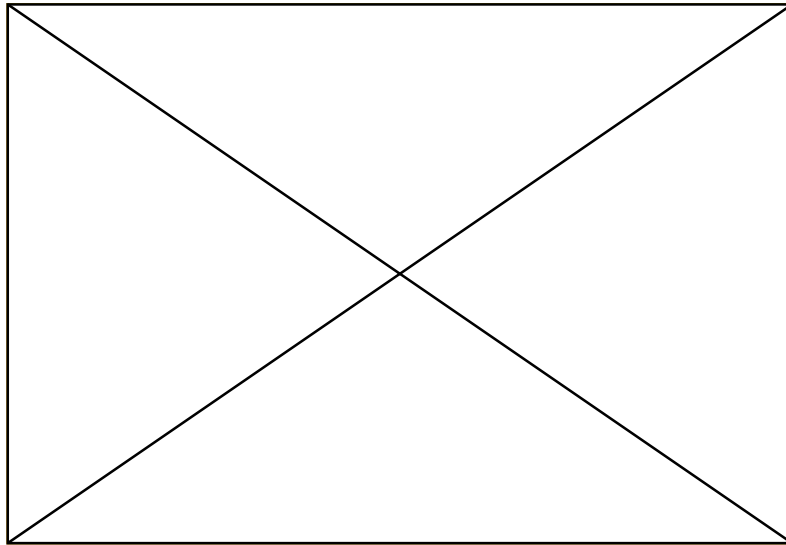
Use the [F3] key to select [F3] or [F3]. Press the [ENT] key. The display [F3] appears.

Before leaving the SET UP mode, you have to store your new settings. Use the [F4] key to select the [F4] display, and press the [ENT] key.

Select [F4] to keep your new settings or [F4] to abort the settings, and press the [ENT] key. After a few seconds, the OPERATION mode will appear.

7.2 Setting Alarm Hysteresis On/Off

The alarm hysteresis is the difference between the levels of alarm occurrence and reset. You can choose between two levels of hysteresis: 0% (=OFF) and approx. 0.5% of the recording span (=ON) (common for all alarms). The initial value is 'ON'.



SETTING PROCEDURE:

Enter the SET UP mode by turning 'ON' the power while pressing and holding the [CH UP] (←ENT) key until the SET UP display appears.

Use the [△] key to select the display [⊠]. Press the [ENT] key.

Press the [△] key until the display [⊠] appears. Press the [ENT] key.

Use the [△] key to select 'ON' or 'OFF'. Press the [ENT] key. The display [⊠] appears.

Before leaving the SET UP mode, you have to store your new settings. Use the [⊠] key to select the [⊠] display, and press the [ENT] key.

Select [⊠] to keep your new settings or [⊠] to abort the settings, and press the [ENT] key. After a few seconds, the OPERATION mode will appear.

NOTE Hysteresis setting is only valid for High and Low alarms. Hysteresis setting for difference alarms will be ignored.

7.3 Setting A/D Integration Time (Pen model)

The purpose of the following setting is to specify which A/D integration time will be used. Depending on the power supply, the integration time will affect the ability of noise rejection and therefore the recording.

If the power supply of the recorder and of the measuring object are the same, the effect of noise will be automatically minimized and the (initial) value of AUTO is the recommended one.

If the power supplies are different, you should select from 50Hz or 60Hz integration time. The choice depends on the power supply of the instrument with the highest noise level.

There are three possibilities:

- AUTO: integration time depends on the power supply of the recorder.
- 50Hz
- 60Hz.

The initial value is 'AUTO'.

SETTING PROCEDURE:

Enter the SET UP mode by turning 'ON' the power while pressing and holding the [CH UP] (←ENT) key until the SET UP display appears.

Use the [△] key to select the display [⊠]. Press the [ENT] key.

Select 'AUTO', '50' or '60' according to your situation using the [△] key. Then press the [ENT] key. The display [⊠] appears.

Before leaving the SET UP mode, you have to store your new settings. Use the [⊠] key to select the [⊠] display, and press the [ENT] key.

Select [⊠] to keep your new settings or [⊠] to abort the settings, and press the [ENT] key. After a few seconds, the OPERATION mode will appear.

7.4 Setting Upscale/Downscale TC Burnout

The purpose of the following setting is to specify where the pens will move in the case of a TC-burnout. You can choose from moving to the right (UP) or to the left (DOWN). This is common for every channel. You can select ON or OFF for each channel. The initial value is 'UP', and 'OFF' for every channel.

SETTING PROCEDURE:

Enter the SET UP mode by turning 'ON' the power while pressing and holding the [CH UP] (←ENT) key until the SET UP display appears.

Use the [F1] key to select the display [CH 1]. Press the [ENT] key.

Use the [F2] key to select the display [CH 2]. Press the [ENT] key.

Select [UP] or [DOWN] using the [F3] key. Press the [ENT] key.
The display [b _ a u t] appears.

This burnout processing is ON/OFF selectable per channel.

Press the [ENT] key.

Use the [F4] key to select the display [CH 1]. Press the [ENT] key.

Select the channel No. using the [F1-F4] key for which you want to specify this burnout processing. Then press the [ENT] key.

Select 'ON' or 'OFF'. Then press the [ENT] key. The display [CH 1] appears.

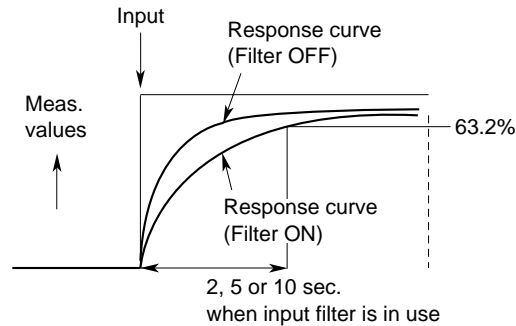
Before leaving the SET UP mode, you have to store your new settings. Use the [F5] key to select the [CH 1] display, and press the [ENT] key.

Select [CH 1] to keep your new settings or [CH 2] to abort the settings, and press the [ENT] key. After a few seconds, the OPERATION mode will appear.

7.5 Configuring the Input Filter (Pen Model)

Noise in the measured signal can be suppressed in the final measurement by using an input filter. The purpose of this setting is to select for each channel whether or not to use a filter, and if so, to select a time constant of damping.

A filter works as follows:



If a filter is used, the response time can be selected from 2, 5 or 10 seconds.

You can choose from three filters:

- 2 seconds
- 5 seconds
- 10 seconds.

The initial value is '**OFF**'.

SETTING PROCEDURE:

Enter the SET UP mode by turning '**ON**' the power while pressing and holding the [**CH UP**] (**←ENT**) key until the SET UP display appears.

Use the [**⊠**] key to select the display [**F ! L L r**]. Press the [**ENT**] key.

Select the channel No. using the [**⊠**] key for which you want to specify a filter. Then press the [**ENT**] key.

Use the [**⊠**] key to select the type of filter you want to use. You can choose from '**OFF**', '**2**', '**5**' or '**10**'. Press the [**ENT**] key. The display [**F ! L L r**] will appear.

Press the [**ENT**] key to continue the setting for other channels. The filter setting has been completed, but has not been stored yet.

Before leaving the SET UP mode, you have to store your new settings. Use the [**⊠**] key to select the [**⊠**] display, and press the [**ENT**] key.

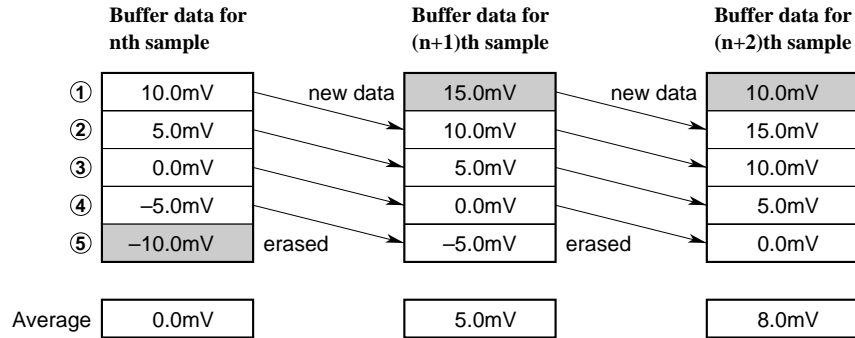
Select [**⊠**] to keep your new settings or [**⊠**] to abort the settings, and press the [**ENT**] key. After a few seconds, the OPERATION mode will appear.

7.6 Setting for Moving Average Calculations (Dot-printing model)

Noise in the measured signal can be suppressed in the final measurement by computing a moving average. It is possible to record a moving average calculated over the previous X samples, selectable from the previous 2 samples up to the previous 16 samples. The purpose of the following setting is to select for each channel whether or not to compute a moving average, and if so, over how many samples. (One sampling period is five seconds.)

The initial value is **'OFF'**.

Example: (let us assume a moving average over five samples is selected)



SETTING PROCEDURE:

Enter the SET UP mode by turning **'ON'** the power while pressing and holding the [CH UP] (←ENT) key until the SET UP display appears.

Use the [] key to select the display [n _ AVE]. Press the [ENT] key.

Select the channel No. using the [] key for which you want to compute a moving average. Then press the [ENT] key.

Use the [] key to select the number of samples. You can choose from **'OFF'**, **'2'**, **'3'**, ... up to **'16'**. Press the [ENT] key. The display [n _ AVE] will appear.

Press the [ENT] key to continue the setting for other channels. The moving average setting has been completed, but has not been stored yet.

Before leaving the SET UP mode, you have to store your new settings. Use the [] key to select the [] display, and press the [ENT] key.

Select [] to keep your new settings or [] to abort the settings, and press the [ENT] key. After a few seconds, the OPERATION mode will appear.

7.7 Turning Offset Settings Protection On/Off

Configure the recorder so changes can (on) or cannot (off) be made to the offset settings in the SET mode. And in the list printing, if ON is set, the offset data are printed.

NOTE When protection is turned on, you can set an offset value must be set in the SET mode. The initial value is 'OFF'

SETTING PROCEDURE:

Enter the SET UP mode by turning 'ON' the power while pressing and holding the [CH UP] (←ENT) key until the SET UP display appears.

Use the [F5] key to select the display [OFF]. Press the [ENT] key.

Using the [F5] key, select either 'ON' or 'OFF' and then press the [ENT] key. The display [OFF] will appear. The setting is then complete.

Before leaving the SET UP mode, you have to store your new settings. Use the [F5] key to select the [OFF] display, and press the [ENT] key.

Select [OFF] to keep your new settings or [OFF] to abort the settings, and press the [ENT] key. After a few seconds, the OPERATION mode will appear.

7.8 Assigning Different Colors to Channels (Dot-printing model)

You can assign any of the six provided colors to any channel. The initial setting is as follows:

ch.1 = purple
 ch.2 = red
 ch.3 = green
 ch.4 = blue
 ch.5 = brown
 ch.6 = black

SETTING PROCEDURE:

Enter the SET UP mode by turning 'ON' the power while pressing and holding the [CH UP] (←ENT) key until the SET UP display appears.

Use the [⊠] key to select the display [c □ L □ r]. Press the [ENT] key.

Select the channel No. for which you want to change a color. Then press the [ENT] key.

Select the color. Then press the [ENT] key. The display [c □ L □ r] will appear.

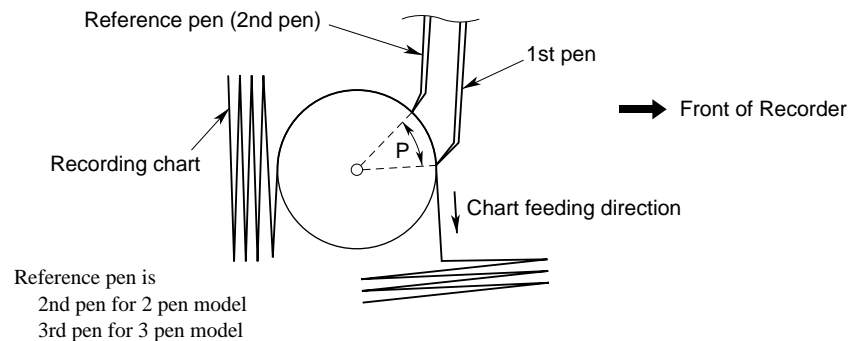
Before leaving the SET UP mode, you have to store your new settings. Use the [⊠] key to select the [⊠] display, and press the [ENT] key.

Select [⊠] to keep your new settings or [⊠] to abort the settings, and press the [ENT] key. After a few seconds, the OPERATION mode will appear.

7.9 Setting Pen Offset Compensation On/Off (Pen model, /D1 option)

The POC function eliminates deviation (phase difference) between the pens on the time axis. The following figure shows a side view of the recording status for the 2 pen model (3 pen model is similar).

The initial value is **'OFF'**.



Recorder as Viewed from the Side

This figure shows that, in any pen recorder (in order to prevent collision between pens) the pens must be offset by a distance P. Therefore, points recorded at the same time are separated on the time axis.

In the case of Pen Offset Compensation, a delay memory is used to store measurement data, equivalent to the time offset P of the pens (other than the reference pen).

The pens will start to record these stored data when the chart is fed by the amount of P (time offset).

NOTE Immediately after the recording has been started, only the reference pen operates normally. The other pens might not seem to operate correctly, but this is due to the time offset. When you stop the recording, the chart will stop and therefore data stored in the delay memory will not be recorded anymore. Therefore, these data will be lost.

Note that an asterisk will be printed in the periodic printout when POC is **'ON'**.

SETTING PROCEDURE:

Enter the SET UP mode by turning **'ON'** the power while pressing and holding the [CH UP] (←ENT) key until the SET UP display appears.

Use the [△] key to select the display [P □ □]. Press the [ENT] key.

Select **'ON'** or **'OFF'** using the [△] key. Then press the [ENT] key. The display [P □ □] appears.

Before leaving the SET UP mode, you have to store your new settings. Use the [△] key to select the [E □ □] display, and press the [ENT] key.

Select [S □ □ E] to keep your new settings or [R □ □ E] to abort the settings, and press the [ENT] key. After a few seconds, the OPERATION mode will appear.

7.10 Turning Alarm Printing On/Off

When alarms occur, the channel number, level, type of alarm and ON/OFF time can be printed on the right side of the chart. It is selectable to get the ON/OFF time of alarms (ON1), the ON time only (ON2) or to get no printout (OFF). Note that alarms will not be printed when the chart speed exceeds 1800 mm/h (Pen model) or 120 mm/h (Dot-printing model).

The initial value is 'ON1', and this setting is common for all channels.

SETTING PROCEDURE:

Enter the SET UP mode by turning 'ON' the power while pressing and holding the [CH UP] (←ENT) key until the SET UP display appears.

Use the [△] key to select the display [P r ! n t]. Press the [ENT] key.

Use the [△] key to select the display [P t n]. Press the [ENT] key.

Select 'ON1' (ON/OFF time of alarms will be printed), 'ON2' (ON time only will be printed) or 'OFF' (no alarm will be printed). Press the [ENT] key.

The display [P r ! n t] appears.

Before leaving the SET UP mode, you have to store your new settings. Use the [△] key to select the [E n d] display, and press the [ENT] key.

Select [E n d] to keep your new settings or [P b o r t] to abort the settings, and press the [ENT] key. After a few seconds, the OPERATION mode will appear.

7.11 Setting Periodic Printout On/Off

The contents of the periodic printout can be selected from the following three:

ON1: Date/time, measured values, scale, and chart-feeding speed are printed.

ON2: Date/time and chart-feeding speed are printed.

OFF: No printout.

The default is set to 'ON1'.

The relationship between the chart-feeding speed and the periodic printout interval is as shown below.

Pen Model

Chart Speed	Periodic Printout Interval
10 to 15mm/h	Every 8 hours
20 to 30mm/h	Every 4 hours
40 to 60mm/h	Every 2 hours
75 to 120mm/h	Every 1 hour
150 to 180mm/h	Every 30 minutes
200 to 300mm/h	Every 20 minutes
360 to 1500mm/h	Every 10 minutes
1800mm/h or more	No printout

Dot-printing Model

Chart Speed	Periodic Printout Interval
10 to 15mm/h	Every 8 hours
20 to 30mm/h	Every 4 hours
40 to 75mm/h	Every 2 hours
80 to 100mm/h	Every 1 hour
120mm/h or more	No printout

SETTING PROCEDURE:

Enter the SET UP mode by turning 'ON' the power while pressing and holding the [CH UP] (←ENT) key until the SET UP display appears.

Use the [△] key to select the display [P r ! n t]. Press the [ENT] key.

Use the [△] key to select the display [d ! 0 ! t]. Press the [ENT] key.

Select 'ON1', 'ON2' or 'OFF' using the [△] key. Press the [ENT] key.

The display [P r ! n t] appear.

Before leaving the SET UP mode, you have to store your new settings. Use the [△] key to select the [E n d] display, and press the [ENT] key.

Select [S t o r E] to keep your new settings or [R e t u r n] to abort the settings, and press the [ENT] key. After a few seconds, the OPERATION mode will appear.

NOTE If set, this printout appears on the chart with a certain regularity.

7.12 Turning Printing of Changes in Chart Speed On/Off

You can select the new chart speed printed on the chart when the chart speed changes. Note that the chart speed will not be printed when the chart speed exceeds 1800 mm/h (Pen model) or 120 mm/h (Dot-printing model). The initial value is 'OFF'.

SETTING PROCEDURE:

Enter the SET UP mode by turning 'ON' the power while pressing and holding the [CH UP] (←ENT) key until the SET UP display appears.

Use the [△] key to select the display [P r ! n t]. Press the [ENT] key.

Press the [△] key until the display [S P d] will appear and press the [ENT] key. Use the [△] key to select 'ON' or 'OFF'.

The display [P r ! n t] appears.

Before leaving the SET UP mode, you have to store your new settings. Use the [△] key to select the [E n d] display, and press the [ENT] key.

Select [S t o p E] to keep your new settings or [P b o r t] to abort the settings, and press the [ENT] key. After a few seconds, the OPERATION mode will appear.

7.13 Turning Printing of Channel Numbers On/Off (Dot-printing model)

If turned on, this function prints each channel number next to the measured value at approximately 25-mm intervals. The default value is 'ON'.

Note that no channel number will be printed if the chart speed exceeds 120mm/h.

SETTING PROCEDURE:

Enter the SET UP mode by turning 'ON' the power while pressing and holding the [CH UP] (←ENT) key until the SET UP display appears.

Use the [△] key to select the display [P r ! n t]. Press the [ENT] key.

Use the [△] key to select the display [C H]. Press the [ENT] key.

Using the [△] key, select either 'ON' or 'OFF' and then press the [ENT] key. The display [P r ! n t] will appear.

Before leaving the SET UP mode, you have to store your new settings. Use the [△] key to select the [E n d] display, and press the [ENT] key.

Select [S t o r E] to keep your new settings or [A b o r t] to abort the settings, and press the [ENT] key. After a few seconds, the OPERATION mode will appear.

7.14 Selecting channel Number or Tag

You can select channel numbers or tags printed out in the periodic, channel (Dot-printing model) and alarm printout.

- If you select **'OFF'**:

Channel numbers

- If you select **'ON'**:

Tags, and in the list printing these printed.

The initial value is **'OFF'**, and this setting is common for all channels.

SETTING PROCEDURE:

Enter the SET UP mode by turning **'ON'** the power while pressing and holding the [CH UP] (←ENT) key until the SET UP display appears.

Use the [△] key to select the display [2 0 0]. Press the [ENT] key.

Select **'ON'** or **'OFF'** using the [△] key.

Press the [ENT] key. The display [2 0 0] appears.

Before leaving the SET UP mode, you have to store your new settings. Use the [△] key to select the [2 0 0] display, and press the [ENT] key.

Select [5 2 0 0] to keep your new settings or [0 0 0 0] to abort the settings, and press the [ENT] key. After a few seconds, the OPERATION mode will appear.

NOTE If you choose "ON" for Tag Settings and execute list printing, you can check the details on the tag defined in the SET mode. (see page 4-8, "Pen model Printing Sample".)

7.15 Changing the Temperature Unit (/D2 option)

For the TC or RTD type, the recorder will automatically append the temperature unit (°C or °F).

The initial value is expressed in “°C”, and common for all channels.

SETTING PROCEDURE:

Enter the SET UP mode by turning ‘ON’ the power while pressing and holding the [CH UP] (←ENT) key until the SET UP display appears.

Use the [△] key to select the display [°C]. Press the [ENT] key.

Select [°C] or [°F] using the [△] key.
Press the [ENT] key. The display [°C] appears.

Before leaving the SET UP mode, you have to store your new settings. Use the [△] key to select the [°C] display, and press the [ENT] key.

Select [] to keep your new settings or [] to abort the settings, and press the [ENT] key. After a few seconds, the OPERATION mode will appear.

NOTE When you change this setting, all settings in the SET mode will return to their initial values.

7.16 Changing Default Settings for REMOTE Operation (option)

This paragraph describes the way to change default settings for REMOTE operation.

NOTE The settings concerning the REMOTE option (/R1) are always accessible, and data entry will be ignored if your instrument is not equipped with this option.

The /R1 option allows you to execute functions on this instrument by a remote trigger (contact input).

The functions which can be executed by a remote trigger are:

- start/stop the recording
- change the chart speed to a preset second chart speed
- have messages printed out (up to five messages)

However, the /R1 terminal has only five terminals, which means that only five functions can be triggered. The printing out of one message takes up one terminal.

Initially the functions are assigned to the terminals as follows:

- 1: start/stop the recording [r [] d] (Record)
- 2: change the chart speed to a preset second chart speed [[] _ [] P d] (Chart Speed)
- 3: have message 1 printed out [[] [] [] 1] (Message 1)
- 4: have message 2 printed out [[] [] [] 2] (Message 2)
- 5: have message 3 printed out [[] [] [] 3] (Message 3)

The purpose of this setting is to assign the to be triggered functions to the five terminals.

SETTING PROCEDURE:

Enter the SET UP mode by turning 'ON' the power while pressing and holding the [CH UP] (←ENT) key until the SET UP display appears.

Use the [△] key to select the display [r [] d]. Press the [ENT] key.

Use the [△] key to select the terminal No. ([r [] d 1] to [r [] d 5]) (/R1 has five terminals.) Press the [ENT] key.

Use the [△] key to select the function which you want to assign to that terminal. You can choose from [r [] d] (start/stop recording), [[] _ [] P d] (second chart speed), [[] [] [] 1] to [[] [] [] 5] (message No. 1, 2, 3, 4, 5). Press the [ENT] key. The display [r [] d] appears.

Before leaving the SET UP mode, you have to store your new settings. Use the [△] key to select the [[] [] d] display, and press the [ENT] key.

Select [[] [] [] []] to keep your new settings or [[] [] [] []] to abort the settings, and press the [ENT] key. After a few seconds, the OPERATION mode will appear.

NOTE If you select 'start/stop recording,' recording stops if the remote input terminal is open and starts if the terminal is closed. If you press the [RCD] key during the startup of remote-controlled recording, recording stops. In contrast, if you press the [RCD] key during the shutdown of remote-controlled recording, recording starts. You can start/stop remote-controlled recording even during the start/stop sequence of recording based on the [RCD] key.

7.17 Turning the Settings Protection Function On/Off

You can protect your settings made in the SET or SET UP modes using a password.

- If you select 'OFF':
the choice does not affect operation in any mode.
- If you select 'ON':

you must type in a password to enter the SET or SET UP mode. The password discussed here is one you set in the following procedure.

The initial value is 'OFF.'

SETTING PROCEDURE:

Enter the SET UP mode by turning 'ON' the power while pressing and holding the [CH UP] (←ENT) key until the SET UP display appears.

Use the [△] key to select the display [L □ □ □]. Press the [ENT] key.

Use the [△] key to select 'ON' or 'OFF'. Press the [ENT] key. In the case you selected Off, the setting is completed.

Set a password in four-digits numerals using the [△] key and the [▷] key. After setting is finished, press the [ENT] key. The display [L □ □ □] appears.

NOTE Never forget the password.

Before leaving the SET UP mode, you have to store your new settings. Use the [△] key to select the [E r d] display, and press the [ENT] key.

Select [5 □ □ □] to keep your new settings or [R b □ □] to abort the settings, and press the [ENT] key. After a few seconds, the OPERATION mode will appear.

7.18 Initializing Settings

The settings which can be initialized concern the settings done in the SET mode only. This initialization does not affect any settings in the SET UP mode.

SETTING PROCEDURE:

Enter the SET UP mode by turning 'ON' the power while pressing and holding the [CH UP] (←ENT) key until the SET UP display appears.

Use the [△] key to select the display [! r ! t]. Press the [ENT] key.

Select [y t t] or [r t] using the [△] key.

Press the [ENT] key. The display [! r ! t] appears.

When leaving the SET UP mode, and you want to initialize your settings. Select the [t r t] display with the [△] key and press the [ENT] key.

Select [t t t r t] to initialize or [r t t r t] to abort initialization, and press the [ENT] key. After a few seconds, the OPERATION mode will appear.

Chapter 8 TROUBLESHOOTING

This chapter describes the causes and recovering methods of recorder errors.

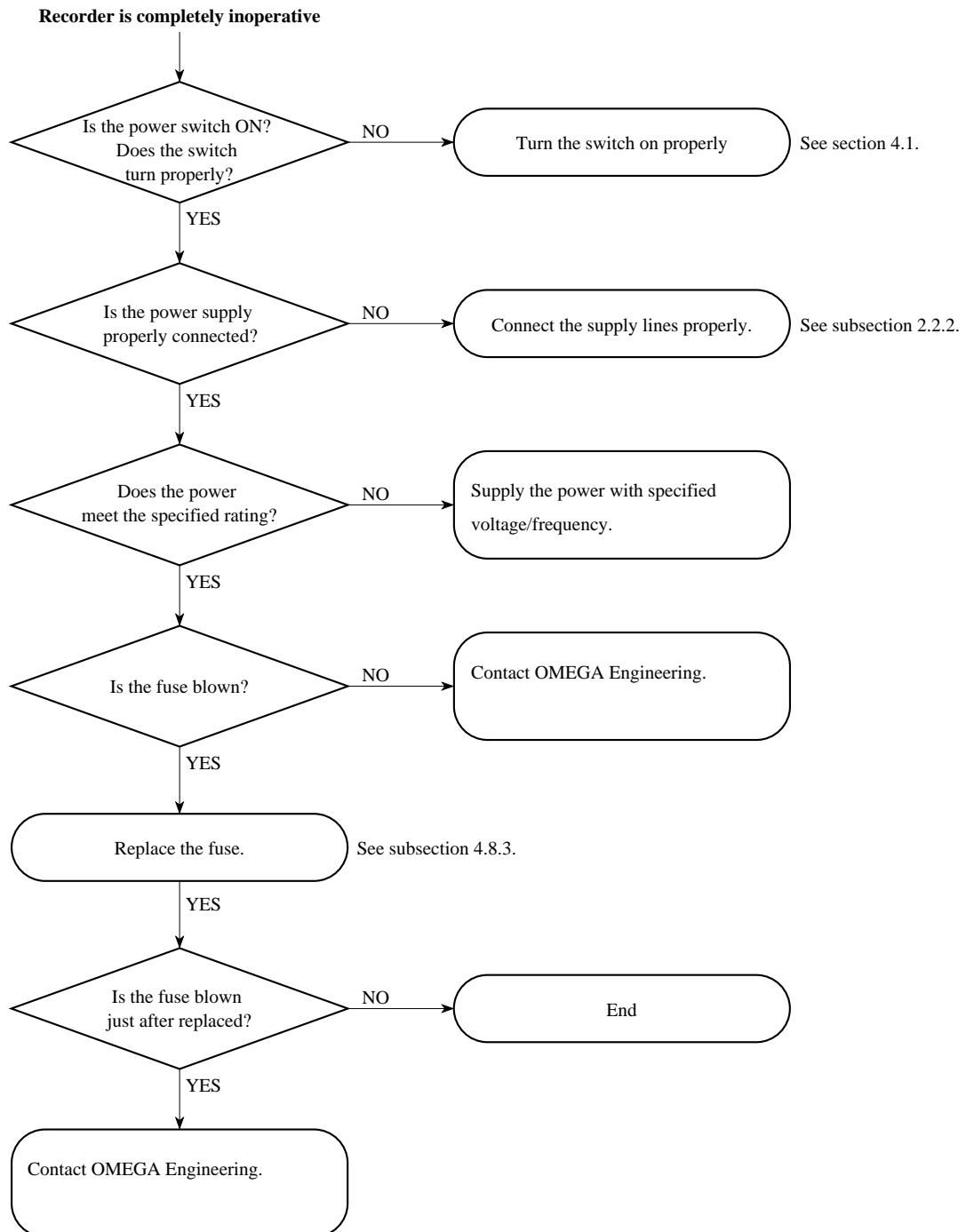
- 8.1 Error Code List
- 8.2 Troubleshooting

8.1 Error Code List

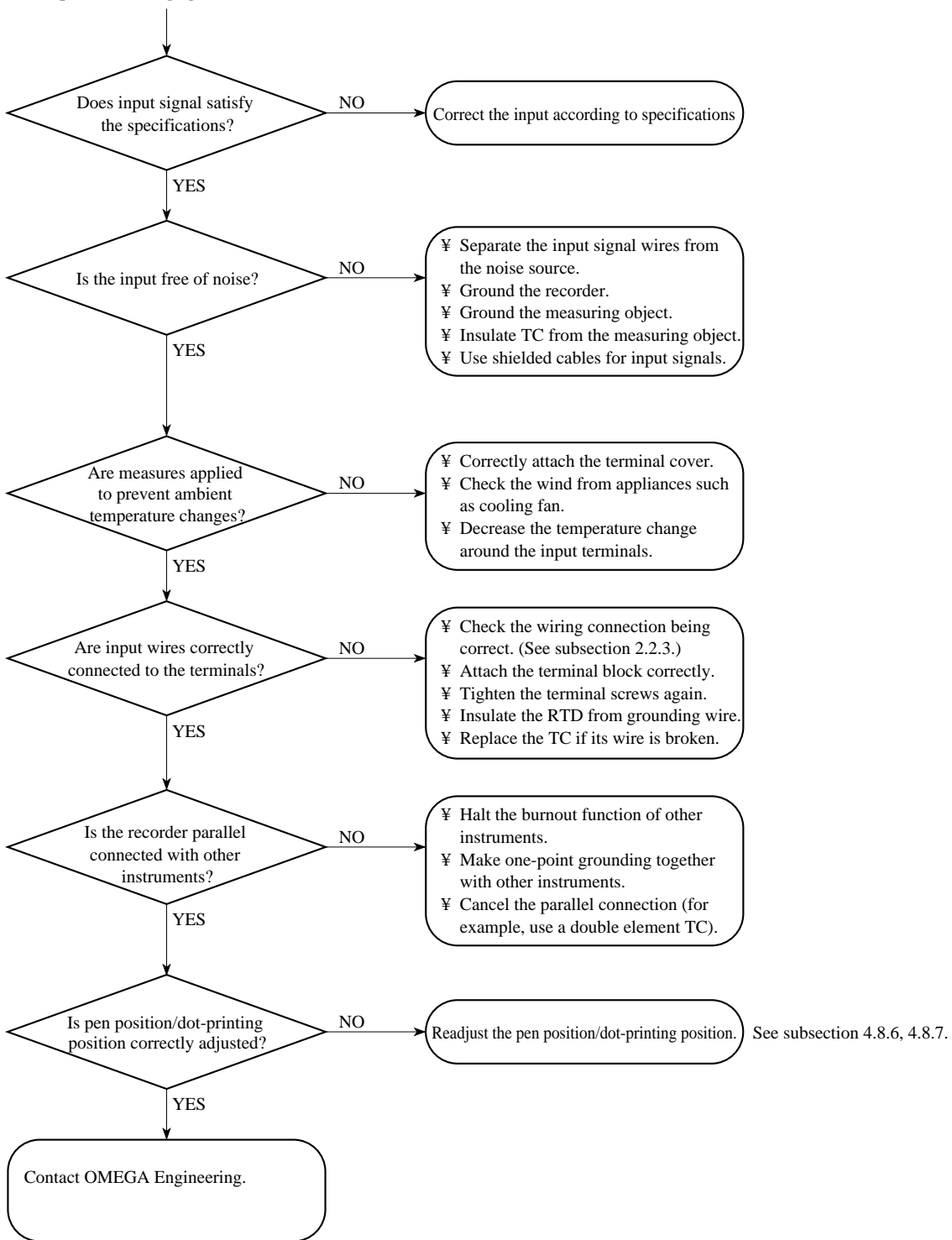
Error Codes	Meaning	Recovery
Er n80	Memory error of input A/D converter (Dot-printing model)	Contact OMEGA ENGINEERING.
Er n8□	Memory error of Xchannel input A/D converter (Pen model) [No Xchannel recording (skipped)]	
Er Ad00	Calibration data error of input A/D converter (Dot-printing model)	
Er Ad□	Calibration data error of Xchannel input A/D converter (Pen model) [No Xchannel recording (skipped)]	
Er n_n81	Main memory reading error	
Er n_n82	Main memory writing error	
Er A_n81	A/D converter memory reading error	
Er A_n82	A/D converter memory writing error	
Er r_n81	Range memory reading error	
Er r0n	System ROM failure	
Er rAn	Main memory failure	
Er Plot	Plotter card failure (Pen model)	
Er ribbon	Ribbon shift, ribbon feed failure (Dot-printing model)	
Er Prn	Printer failure (Dot-printing model)	
Er001	System failure	
Er002	Entered value exceeds allowable setting range	Enter correct data.
Er003	Time setting error	Enter correct time.
Er004	Selection of channel that cannot be set	Type the correct channel number.
Er007	Wrong password	Type in the correct password.
Er012	Attempt to replace pen ([_ P E n) while recording	Stop recording (See section 4.3.).
Er040	Reference channel number larger than the channel with DELT setting	Change the reference channel number. See section 6.1.
Er041	SKIP setting made to reference channel with DELT setting	Change the reference channel number. See section 6.1.
Er042	DI setting made to reference channel with DELT setting	Change the reference channel number. See section 6.1.
Er043	SCALE or SQRT setting made to reference channel with DELT setting	Change the reference channel number. See section 6.1.
Er045	SPAN L same as SPAN R in value	Change the span value. See section 6.1.
Er046	SCL L same as SCL R in value	Change the span value. See section 6.1.
Er060	Attempt to set alarm to SKIPPed channel	Select OFF for setting (See section 6.2).
Er061	Attempt to set alarm to DI channel	Select OFF for setting (See section 6.3).
Er200	Offset setting made to channel whose measuring range is not VOLT, TC, RTD or SCL.	Change the measuring range or the channel.
Er201	Value above 10% of recording span set as offset	Enter another value.

Self-diagnostic Message Printout	Meanings
STORE SET UP SETTINGS AGAIN	Check the settings to maintain the reliability of the internal data. ¥ Enter the SET UP mode, and select [E n d]. ¥ Select [S t o r E], and press the [ENT] key.
CONTACT YOUR NEAREST SALES OR SERVICE CENTER	Failure occurs in nonvolatile storage. Contact OMEGA customer service.

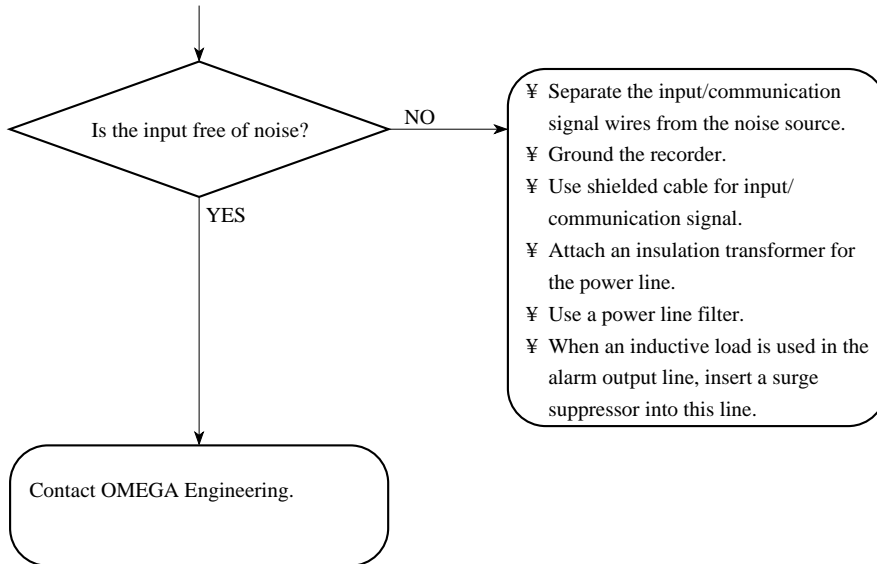
8.2 Troubleshooting



- ¥ Errors exceed specified limits
- ¥ Measuring value indications fluctuate
- ¥ Pen/printer carriage goes off-scale at 0% or 100%.



Glitch is found other than the previously mentioned problems.



WARRANTY / DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of 25 months from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal two (2) year product warranty to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

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RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR WARRANTY RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR NON-WARRANTY REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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